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## LIST OF ABBREVIATIONS.

M. C. Z. or numbers without any reference means Museum of Comparative Zoölogy, Cambridge, Mass.  
 I. and I. U. M. means Indiana University Museum, Bloomington, Ind.  
 A. N. S. P. means Academy of Natural Sciences, Philadelphia, Pa.  
 C. and C. M. means Carnegie Museum, Pittsburgh, Pa.

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Memoirs of the Museum of Comparative Zoölogy  
AT HARVARD COLLEGE.

VOL. XLIII. PART 1.

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# THE AMERICAN CHARACIDÆ.

BY

CARL H. EIGENMANN.

WITH SIXTEEN PLATES.

CAMBRIDGE, U. S. A.:  
Printed for the Museum.

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# THE AMERICAN CHARACIDAE.<sup>1</sup>

## INTRODUCTION.

THE revision of the American Characidae, based on the collections of the Nathaniel Thayer Brazilian Expedition in the Museum of Comparative Zoölogy was commenced by Mrs. Rosa Smith Eigenmann and myself in 1888. A little more than a year later the work was temporarily suspended. The published results, so far as obtained, are enumerated on p. 8-10. Work was resumed in 1903 with the collections of Indiana University and of the United States National Museum, and a monograph completed in 1906.

Types in several museums in London, Paris, and Vienna were examined in 1906 and 1907. In 1907 the study of the collections made by the Thayer Expedition was renewed. This material made it necessary to rewrite the entire monograph, for, forty years after it was gathered, it was still the most important collection of South American fresh-water fishes, and contained a large number of undescribed species and genera.

The revised monograph, through the Tetragonopterinae, was finished in the spring of 1908. During the preparation of this revision it became apparent that the material at my command, from several regions of South America, was deficient. To obtain material from one of these regions, I spent the autumn of 1908 in British Guiana. Volume 5 of the *Memoirs of the Carnegie Museum* contains a detailed account of this Guiana Expedition.

In May, 1909, my position of Curator of Ichthyology in the Carnegie Museum placed me in charge of another large series of South American fresh-water fishes. This collection was made under my general direction, between November 6, 1907 and January 10, 1910, by Mr. John D. Haseman, one of my former students. For the most part it came from areas not covered by the Thayer Expedition. The Director of the Carnegie Museum, Dr. W. J. Holland, has kindly allowed me to incorporate in the present monograph the results obtained from a study of the Carnegie collections.

<sup>1</sup> Contribution from the Zoölogical Laboratory of Indiana University, No. 98.

Still later (December 1911–April 1912) I made extensive collections in Colombia; and in the early part of 1913 two of my students, Mr. Arthur M. Henn and Mr. Charles Wilson, gathered many fishes in the streams of western Colombia. Mr. Henn remained in South America till 1914 and extended the explorations to western Ecuador. Smaller collections were made by Miss Lola Vance in the streams about Tarma, Peru, and by Dr. Ellis and Dr. William Tucker in British Guiana. The collections of the Yale-National Geographic Society Expedition to the Urubamba River have also been available in the preparation of this monograph.

These different collections admirably supplement each other. They are the most extensive collections that have ever been brought together from South America. In the number of specimens at my disposal they far exceed the combined collections recorded in all other museums of the world.

The number of American species of Characins exceeds six hundred; and as they offer some of the best material to demonstrate several facts of evolution it is hoped to illustrate the species quite thoroughly. To provide for the illustrations of the Tetragonopterinae I am indebted to the Trustees of the Elizabeth Thompson Science Fund for an appropriation of \$250.00, and to the Trustees of the Bache Fund for a similar amount. The Carnegie Museum and Mr. H. W. Fowler have granted the reproduction of a number of figures.

The portion of the monograph dealing with Hemigrammus, Hyphessobrycon, and Hasemanina was prepared with the collaboration of Marion Lee Durbin, now Marion Durbin Ellis.

This Memoir deals with the Tetragonopterinae,<sup>1</sup> Rhoadsiinae, Glandulocaudinae, Iguanodectinae, Stethaprioninae, and Stiehanodontinae. All of the then known species of these subfamilies, except the species of *Stevardia*, were included by Günther (Cat. fishes Brit. Mus., 1861, 5) in the Tetragonopterinae. There are recognized in this Memoir fifty-two genera, and three hundred and twelve species. Over half of these were described during the course of the preparation of the Monograph.

The subfamily Tetragonopterinae, at present the dominant group of tropical American fishes, was defined by Günther (*loc. cit.*) to include *Piabucina*, *Alestes*, *Brachyalestes*, *Chirodon*, *Chalceus*, *Brycon*, *Chalcinopsis*, *Chalcinus*, *Gasteropelecus*, *Piabuca*, and *Agoniates*, besides the genera listed below. Eliminating these genera, which are now relegated to various separate subfamilies

<sup>1</sup> The portion of the Monograph dealing with the Cheirodontinae appeared recently in the Memoirs Carnegie Museum, 1916, 7, p. 1–99, pl. 1–17.

or which (*Alestes* and *Brachyalestes*) are geographically extra-limital, there remain:—*Tetragonopterus*, with thirty-two species; *Scissor*, with one species; *Pseudochalceus*, with one species; *Bryconops*, with two species; *Creagrutus*, with one species; making a total of five genera, with thirty-seven species.

Of the *Iguanodectinae*, which were included in Günther's *Tetragonopterina*, he recorded two species belonging to the genus *Piabuca*.

He recorded four species of *Corynopoma* and placed them in his *Erythrina*. They are the *Stevardia albipinnis* considered below in the discussion of the new subfamily, *Glandulocaudinae*.

In the last general review of Günther, there were a grand total of seven genera and forty-three species, as compared with the fifty-two genera and over three hundred species, known today.

## SOURCES OF THE MATERIAL.

### THE NATHANIEL THAYER BRAZILIAN EXPEDITION.

In January 1807, Karolina, Archduchess of Austria, was married to the Crown Prince of Brazil. In the retinue accompanying the young couple to Brazil went Johann Natterer of Wien. Natterer remained in Brazil for eighteen years and collected extensively from Rio de Janeiro to Cuyaba, thence down the Madeira to the Amazon and up the Rio Negro and Rio Branco. Taking advantage of the opportunity, the King of Bavaria sent two naturalists, Johann Baptist von Spix and Carl Friedrich von Martius with the bridal party. They also collected natural history specimens. The routes of travel of Natterer and of Spix and Martius are shown on Plate 1.

The fishes collected by Natterer were described by Heckel, Kner, and Steindachner. Those collected by Spix and Martius were being described by Spix when he died. Louis Agassiz, then a student at the University of Munich, was selected to complete the work of Spix. Agassiz's work resulted in a sumptuous folio, and a desire to personally inspect the fauna of Brazil, a desire fulfilled forty years later. In 1865, the generosity of Mr. Nathaniel Thayer made it possible for Agassiz to undertake his journey to Brazil.

The assistants of the Thayer Expedition were James Burkhardt, *artist*, J. G. Anthony, *conchologist*, C. F. Hartt, and Orestes St. John, *geologists*, J. A. Allen, *ornithologist*, and George Seeva, *preparator*. Besides these assistants

several volunteers accompanied the Expedition: these were Edward Copeland, Newton Dexter, Walter Hunnewell, William James, Stephen Van Rensselaer Thayer, and Thomas Ward.

Agassiz had the further assistance of the Brazilian Government through the Emperor, Dom Pedro II. Among Brazilians who joined the Expedition or aided in other ways were Major Coutinho, Messrs. Vinhas, Bourget, Talisman, Dr. Justa, Couto de Magalhaês, and others.

The Expedition started late in March, 1865, and landed at Rio de Janeiro on April 22nd. Three months were spent about Rio. On July 25th Agassiz with Coutinho, Burkhardt, Bourget, Hunnewell, and James, joined later by Dexter and Thayer, went along the coast to Bahia (July 28th), Pernambuco (31st), Parahyba do Norte (August 2nd), Ceará (4th), Maranhão (6th) and Para (11th). On August 20th the party started up the Amazon. It was divided in various ways. One or two of the assistants were left, or sent to some place to collect for longer or shorter periods to rejoin the main party at times. The itinerary up the Amazon was:—

*August 20, 1865.* Start up the Amazon. 20. Breves. 21. Tajapurú. 22. Gurupa. 23. Porto do Moz. 25. Montalegre. (Monte Alégre). 26. Santarém (Dexter, James, and Talisman, a young Brazilian start up the Tapajós from here; Bourget and Hunnewell remain at Santarém. They rejoin the Expedition at Manaus). *September 1.* On an arm of the Rio Ramos, connecting the Amazons, through the Maubés, with the Madeira. 3. Return to steamer at Villa Bella. 4. Manaus. 10. Leave Manaus. 13. Coari. 14. Tefé. 15. Fonte Boa. 17. San Paulo. 18. Tabatinga. Bourget remains at Tabatinga. 20. Left Tabatinga. James and Talisman remain at San Paulo to ascend the Iça. 20. Left Fonte Boa again. 21. Tefé again — take up residence on Lake Tefé. Sitio. most remarkable catch in Forest Lake. *October 17.* James and Talisman returned from Iça, and Jutahy. About Oct. 21, left Tefé. Verge of rainy season. Bourget returns from Tabatinga. 23. Reach Manaus. 27. Go to Lake Hyanguary. 29. Return to Manaus for a six weeks' stay. *December 6.* Thayer returns from Lago Alexo, Bourget and Thayer from Cudajas, James from Manacapuru, Coutinho from Lake Hyanguary, José-Fernandez, Curupira, etc. 10. Dexter and Talisman returned from Rio Branco. Water too high. Leave for Maubés on war vessel. 14. Mucaja-Tuba. 16. Maubés. 20. Leave Maubés. 25. Manaus. 27. Leave Manaus to ascend the Rio Negro. 29. Pedreira. 31. Manaus. *January 16, 1866.* Villa Bella and Maubés again. 18. Lago Maximo. 20. Leave Villa Bella. 21. Obidos. 22. Santarém at the mouth of the Tapajós. 26. Monte Alégre. Trip to Serra Erere. 29. Leave Monte Alégre. *About 30.* Porto do Moz on the Xingu: Vinhas brings collections from above and below the cascades of the Xingu. *February 1.* Gurupa. 2. Tajapurú. 4. Reached Para. *March 26.* Leave Para for Rio de Janeiro. *April 2.* An inland excursion at Ceará. 6. Pacatuba and the region about it. 11. Ceará. 16. Leave Ceará for Rio. *July 2.* Sail for home.

During Agassiz's trip up the Amazon with his immediate assistants, the rest of his party was divided to collect in the rivers of eastern Brazil from Rio de Janeiro to Para. "One object was kept constantly in view throughout this

Expedition,—namely, that of ascertaining how the freshwater fishes are distributed throughout the great river systems of Brazil.”

The routes of the separate parties are indicated on Plate 1. Hartt and Copeland collected in the lower courses of the rivers from the San Francisco to Rio de Janeiro.

They left Rio de Janeiro on June 19. They visited the lower courses of the Parahyba collecting at Campos and San Fidelis and ascended the tributary Muriaby. From San Fidelis they crossed the divide to the Itabapua and descended that stream to its mouth going thence via the Rio Itapemerim, Rio Novo,<sup>1</sup> and Guarapary to Victoria. On a subsequent journey from Rio they ascended the Rio Doce for ninety miles to the first fall at Porto de Souza and collected also at Linhares in the Rio Doce and the lake and river Juparana. From Linhares they went to San Matheus and the Rio Mucury in which they collected at its mouth, Porto Alegre<sup>2</sup> and some distance inland at Santa Clara. From Santa Clara they went to Philadelphia collecting on the way in the Rio Urucu and thence to Calhoa and Minas Novas both on the Arassuahy. They separately descended the Rio Jequitinhonha, three hundred and sixty miles to the sea. They collected next at Cannavieras and ascended the Rio Pardo to its fall. Collections were also made at Belmonte, Santa Cruz and Porto Seguro on the coast south of the Rio Jequitinhonha. They then visited Bahia and returned to Rio de Janeiro.<sup>3</sup>

St. John, Allen, Ward, and Seeva went from Rio de Janeiro to the Rio Parahyba and Juiz de Fora, across the Serra do Mantiqueira to Barbacena. They collected at Rodeio, Rio Macacos, a tributary of the Santa Anna, State Rio de Janeiro. Ward left the party at Barbacena and went over Ouro Preto and Santa Barbara to Diamantina “passing from one river-basin to another in order to examine as many of the tributaries of the Rio Doce and the Jequitinhonha as possible.” Ward then crossed the San Francisco at Januaria and went to the Tocantins which he followed to its junction with the Amazon. St. John, Ward, and Allen continued *via* Logoa Dourada and Pradas across the Rio Carandahy and Rio Paraopeba to Sabura (Rio Macacos, into Rio San Francisco), Santa Luiza, Lagoa Santa, Sete Lagoas and Gequitiba. Seeva remained about Lagoa Santa and later went via Rio de Janeiro to Canto-Gallo.

St. John and Allen went down the San Francisco to Januaria. Here

<sup>1</sup> Note also another Rio Novo in Haseman's itinerary, p. 10.

<sup>2</sup> Not the Porto Alegre, Rio Grande do Sul where von Ihering and Haseman collected.

<sup>3</sup> Collections were made by Hartt in the Rio San Francisco below the fall either at this time or on a later trip. Hartt and Copeland sent in specimens recorded as from Jacurpe and Posuca, localities I have not been able to locate.

Allen, on account of his health, was compelled to leave the Expedition. St. John followed the San Francisco to Villa do Barra then went by land through the valley of the Rio Grande, a tributary of the San Francisco to Santa Rita, "thence to Mocambo and across the table-land separating the basin of the Rio San Francisco from that of the Rio Paranyhyba." He collected in the Basin of the Rio Paranyhyba at Paranagua, Manga, San Gonçallo, and Therezina. Near the latter place he collected in the Rio Poty or Puty a tributary of the Rio Paranyhyba. From Therezina he crossed the divide to Caxias on the Itapicuru which empties into the ocean at Maranham.<sup>1</sup> He reached the latter place on January 8, 1866.

The collection of fresh-water fishes made by Louis Agassiz and his assistants is the largest ever brought together by a single expedition. The hope of Agassiz to complete the work on the fishes was not realized, the very wealth of material making a comprehensive report almost herculean. Dr. Franz Steindachner, Hofrat and Intendant of the K. K. Naturhistorisches Hofmuseum, Wien, who has written extensively concerning the collections made by Natterer, obtained leave of absence from May 1870 until June 1873. During this time he accompanied Professor Agassiz on the Hassler Expedition, December 1871 to August 1872, and devoted more than two years to the study of the fishes secured during the Thayer Expedition which he considered "without any exaggeration the richest and most complete in the world."

The following papers are based wholly or in part on the Thayer Brazilian collection:

AGASSIZ, LOUIS and Mrs. E. C. A journey in Brazil. Boston, 1868.

EIGENMANN, C. H. The evolution of the catfishes. *Zoe*, 1890, **1**, p. 10-15.

On the presence of an operculum in the Aspredinidae. *Amer. nat.*, 1892, **26**, p. 71.

Steindachneria. *Amer. nat.*, 1897, **31**, p. 158-159.

New genera of South American freshwater fishes, and new names for some old genera. *Smith. misc. coll.*, 1903, **45**, p. 144-148.

EIGENMANN, C. H. and R. S. A list of the American species of Gobiidae and Callionymidae, with notes on the specimens contained in the Museum of Comparative Zoölogy, at Cambridge, Massachusetts. *Proc. Cal. acad. of sci.*, 1888, ser. 2, **1**, p. 51-78.

American Nematognathi. *Amer. nat.*, 1888, **22**, p. 647-649.

Preliminary notes on South American Nematognathi, I. *Proc. Cal. acad. sci.*, 1888, ser. 2, **1**, p. 119-172.

Preliminary descriptions of new species and genera of Characinidae. *West Amer. sci.*, 1889, **6**, p. 7-8.

<sup>1</sup>There is another river Itapicuru emptying into the ocean between the bay of Bahia and the mouth of the San Francisco, in which Dr. Haseman made extensive collections, (p. 10).

- Description of new nematognathoid fishes from Brazil. West Amer. sci., 1889, **6**, p. 8-10.
- Preliminary notes on South American Nematognathi, II. Proc. Cal. acad. sci., 1889, ser. 2, **2**, p. 28-56.
- A review of the Erythrininae. Proc. Cal. acad. sci., 1889, ser. 2, **2**, p. 100-116, pl. 1.
- A revision of the edentulous genera of Curimatinae. Ann. N. Y. acad. sci., 1889, **4**, p. 409-440.
- A revision of the South American Nematognathi or catfishes. Occ. papers, Cal. acad. sci., 1890, **1**, p. 1-508, pl. 1.
- A catalogue of the freshwater fishes of South America. Proc. U. S. N. M., 1891, **14**, p. 1-82.
- GARMAN, SAMUEL. On the species of the genus *Chalcinus* in the Museum of Comparative Zoölogy at Cambridge, Mass., U. S. A. Proc. Essex inst., 1890, **22**, p. 1-7.
- On the species of *Gasteropelecus*. Proc. Essex inst., 1890, **22**, p. 8-10.
- On the species of *Cynopotamus*. Proc. Essex inst., 1890, **22**, p. 11-14.
- On the species of the genus *Anostomus*. Proc. Essex inst., 1890, **22**, p. 15-23.
- On a genus and species of the Characines (*Henochilus wheatlandii*, gen. n. et sp. n.). Proc. Essex inst., 1891, **22**, p. 49-52, pl. 1.
- The cyprinodonts. Mem. M. C. Z., 1895, **19**, p. 1-180, pl. 1-12.
- JORDAN, D. S. and EIGENMANN, C. H. A review of the Sciaenidae of America and Europe. Rept. U. S. comm. fish., 1889, **14**, p. 343-452, pl. 1-4.
- A review of the genera and species of Serranidae found in the waters of America and Europe. Bull. U. S. fish comm., 1888, **8**, p. 329-442.
- STEINDACHNER, FRANZ. Die süßwasserfische des südöstlichen Brasiliens. Sitz. Akad. wissenschaft. Wien, 1875, **70**, abth. I, p. 499-538, pl. 1-6. Separate, p. 1-40, pl. 1-6.
- Beiträge zur kenntniß der chromiden des Amazonenstromes. Sitz. Akad. wissenschaft. Wien, 1875, **71**, abth. I, p. 61-137, pl. 1-8. Separate, p. 1-77, pl. 1-8.
- Über einige neue Brasilianische siluroiden aus der gruppe der doradinen. Sitz. Akad. wissenschaft. Wien, 1875, **71**, abth. I, p. 138-151, pl. 1-4. Separate, p. 1-14, pl. 1-4.
- Die süßwasserfische des südöstlichen Brasiliens. II. Sitz. Akad. wissenschaft. Wien, 1875, **71**, abth. I, p. 211-245, pl. 1-6. Separate, p. 1-35, pl. 1-6.
- Beiträge zur kenntniß der characinen des Amazonenstromes. Sitz. Akad. wissenschaft. Wien, 1875, **72**, abth. I, p. 6-24, pl. 1-2. Separate, p. 1-18, pl. 1-2.
- Ichthyologische beiträge. IV. Sitz. Akad. wissenschaft. Wien, 1876, **72**, abth. I, p. 551-616, pl. 1-13. Separate, p. 1-65, pl. 1-13.
- Ichthyologische beiträge. V. Sitz. Akad. wissenschaft. Wien, 1876, **74**, abth. I, p. 49-240, pl. 1-15. Separate, p. 1-190, pl. 1-15.
- Die süßwasserfische des südöstlichen Brasiliens. III. Sitz. Akad. wissenschaft. Wien, 1876, **74**, abth., I, p. 559-694, pl. 1-13. Separate, p. 1-136, pl. 1-13.
- Die süßwasserfische des südöstlichen Brasiliens. IV. Sitz. Akad. wissenschaft. Wien, 1877, **76**, abth. I, p. 217-230, pl. 1-2. Separate, p. 1-14, pl. 1-2.
- Über einige neue und seltene fischarten, etc. Denk. Akad. wissenschaft. Wien, 1878, **41**, p. 1-52, pl. 1-9.
- Beiträge zur kenntniß der flussfische Südamerika's, I. Denk. Akad. wissenschaft. Wien, 1879, **41**, p. 151-172, pl. 1-3. Separate p. 1-24, pl. 1-4.
- Ichthyologische beiträge. VIII. Sitz. Akad. wissenschaft. Wien, 1880, **80**, abth. I, p. 119-191, pl. 1-3. Separate, p. 1-73, pl. 1-3.

Beiträge zur kenntniss der flussfische Südamerika's. II. Denk. Akad. wissensch. Wien, 1881, **43**, p. 103-146, pl. 1-7. Separate p. 1-46.

Beiträge zur kenntniss der flussfische Südamerika's. III. Denk. Akad. wissensch. Wien, 1881, **44**, p. 1-18, pl. 1-5. Separate, p. 1-18, pl. 1-5.

Beiträge zur kenntniss der flussfische Südamerika's. IV. Denk. Akad. wissensch. Wien, 1882, **46**, p. 1-44, pl. 1-7. Separate, p. 1-44, pl. 1-7.

#### THE CARNEGIE MUSEUM EXPEDITION TO CENTRAL SOUTH AMERICA.

A detailed account of this Expedition is given in volume 9 of the Annals of the Carnegie Museum.

During this Expedition Mr. Hascman collected at the following localities:—

*November 6, 1907.* Rio Coite, into the Rio Salitre, into Rio San Francisco. 6. Rio Aqua Branca, into Rio Itapicuru. 7. Rio Ipema, into Rio Itapicuru. Rio Lannaras, small creek into Rio Itapicuru. Rio Zinga, small creek into Rio Itapicuru. 8. Rio Itapicuru Grande, headwater of Rio Itapicuru. Rio Paiaia, into Rio Itapicuru. Rio de Jacobina, into Rio Itapicuru. 10. Lagoa Salgado — Rio Salitre into Rio San Francisco. 11. Bom Fim, Rio Amaratú, into Rio Itapicuru. 12. Saã Thome, Rio Salitre, into Rio San Francisco. 14. Rio Salitre, into Rio San Francisco. Baixa Grande, Rio Paqui into Rio Salitre, into Rio San Francisco. Rio Paqui, into Rio Salitre near Baixa Grande. 21. Finca Amaratú, Rio Itapicuru. Creek on farm emptying into Rio Itapicuru Mirim. 27, 28. Joazeiro, Rio San Francisco. *December 6.* Barra, fork of Rio San Francisco and Rio Grande. *December 12, 18.* Januaria, Rio San Francisco. 15. Cachoeira de Pirapora, Rio San Francisco. 23. Lagoa de João Pereira Barra, Rio San Francisco. 24. Lagoa de Porto, near Barra, Rio San Francisco.

*January 4, 1908.* Lagoa Barreiras, Rio San Francisco. 6-9. Boqueirão, Rio Grande of Rio San Francisco Basin. 16. Lagoa Parnagua or Paranagua, Parahyba Basin. 24. Santa Rita de Rio Preto, into Rio Grande, into Rio San Francisco. 27. Rio Preto, ten miles below fork of Rio Sapão. *February 4.* Cachoeira da Velha, Rio Novo, into Rio Somno, into Tocantins. 6. Stromé, Rio Somno. Headwaters. 11. Rio Sapão, into Rio Preto, into Rio San Francisco. Near Prazer. 15. Rio Preto, into Rio Grande, into Rio San Francisco. 23, 24. Barra, Rio San Francisco. *March 2.* Queimadas, Rio Itapicuru. 4. Alagoinhas, Rio Catu. 5. Rio Itapicuru, 12 miles from Timbo. 11, 13. About Bahia; 22, Penedo, mouth of Rio San Francisco. 30. Propria, Rio San Francisco. *April 2.* Penedo. 6. Maceio, on the coast. 7. Penedo. 10. Acaraju. 14. Cachoeiro, Rio Paraguassu. *May 4.* Sete Lagoas, into Rio das Velhas, into Rio San Francisco. 10, 11, 13. Creek, ponds, mountain rills near Rio das Velhas. 14. Miguel Burnier, headwaters of Rio das Velhas and tributary of Paraopeba. 19. São João del Rey, Rio das Mortes, into Rio Grande, into Rio Paraná. 21. Sítio, Rio das Mortes. 22. Serraria, Rio Parahybuna, into Rio Parahyba. 24-28. Creeks, pools, river at Rio Doce. *June 1-3.* Entre Rios, Rio Parahyba. 13-15. Campos, Rio Parahyba. 16. Lagoa Feia, south of mouth of Rio Parahyba. 18, 19. Rio Itapemirim and swamp near Muncz Freire. 23, 24. São João da Barra, Rio Parahyba. *July 5.* Barra da Pirahy. 7, 8. Bom Jardim, above and below falls, Rio Grande, into Rio Paraná. 9, 10. Santa Rita de Jacutinga, Rio Preto, into Rio Parahyba. 12, 13. Barra da Pirahy, Rio Parahyba. 14, 15. Jacarehy, Rio Parahyba. 17, 20. Mogy das Cruzes, Rio Tieté, into Rio Paraná. 23. Piracicaba, Rio Tieté, into Rio Paraná. 23.



Sapina, Rio Tieté, into Rio Paraná. Santos, coast of São Paulo. 25. Alto da Serra, Rio Tieté, into Rio Paraná. 26, 28. Mogy, into Santos Bay. Creek at base of mountains, ten miles from Santos. 29. Piassaguera, near Santos. 29. Santos. 31. Rio Pilao, fifteen miles southwest of Santos and Cubatão, Rio Cubatão. Clear, swift and rocky creeks seven miles west of Santos. August 7. Mogy Mirim, into Rio Mogy Guassu, into Rio Grande, into Rio Paraná. Corrego de João de Deus. Twelve miles from Mogy Mirim. 14. Rio Paranahyba, into Rio Paraná. 18, 19. Jaguará, Rio Grande, into Rio Paraná. 25, 26. Mogy Guassu, Rio Mogy Guassu, into Rio Grande, into Rio Paraná. September 1. Bebedouro, near Rio Grande, and Rio Paraná. 5-9. Piracicaba, into Rio Tieté, into Rio Paraná. Above and below big falls. 14. Salto de Avanhandava, Rio Tieté. 22. Salto das Cruzes, Rio Tieté. 27. Itapura, Rio Tieté; Ribeirão Azul, twelve miles from Tieté. October 8. Ribeirão Azul. 11. Miguel Calmon; twenty miles east of Miguel Calmon. Bauhru, Rio Tieté. Salto Grande de Paranapanema, into Rio Paraná. November 27. Agua Quente, into Rio Ribeira da Iguapé. 28. Cavernas das Areas. Sixteen miles southwest of Iporanga in Serra do Mar. December 1. Iporanga, Rio Ribeira da Iguapé. 5, 8. Xiririca, Rio Ribeira da Iguapé. 15, 16. Iguapé, Rio Ribeira da Iguapé. 22. Serrinha Paraná, Rio Iguassú, into Rio Paraná. Rio das Mortes, into Rio Iguassú. Creek six miles west of Serrinha, with numerous falls. 27-29. Porto União da Victoria, Rio Iguassú.

January 2-4, 1909. Morretes, on Marunby, into Rio Nhundiaquara, into ocean at Pranagua. 17-24. Porto Alegre, Rio Grande do Sul, Rio Guahyba. 26-27. Cachoeira Rio Jacuhy, into Lago dos Patos at Rio Grande do Sul. 29. Santa Maria, Rio Vaecacahy-Mirim, into Rio Guahyba into Rio Jacuhy. 31. Cacequy, Rio Ibaquhy, into Rio Uruguay. February 1. Cacequy. 5. Uruguayana, Rio Uruguay. Rio Negro, Uruguay or Paso de los Torros, into Rio Uruguay. 17. Arroyo Miguelete, Montevideo. 25, 27. San Juan, Argentina. March 4. Rio Colorado, Argentina. Choel-choel, tributary of Rio Negro. 5. Rio Negro. 6. Muddy ponds twenty miles east of town of Colorado. 11. Buenos Aires, Rio de Prata. 23. Asuncion, Paraguay. 30. Cerro de Lambaré, five miles below Asuncion in saline swamp. 31. Bays in front of and near Asuncion. April 2. Sapucay, Paraguay. In mountain rills. 5. Arroyo Poná near Sapucay. 7, 8. Arequa, Laguna Ipacary. 11, 13, 14. Villa Hays. 27. Urucum Mountains, 25 miles back of Corumba. 28. Corumba. May 2. Urucum Mountains. 6, 7. Puerto Suarez, 15 km. from Corumba. 9. Corumba. 23-27. São Luiz de Cáceres, Matto Grosso. June 2, 3. Campos Alégre, Rio Jauru, into Rio Paraguay. San Matias, Bolivia, into Rio Paraguay. 10. Rio São Francisco, into Rio Paraguay. 12. Rio Santa Rita, into Rio Paraguay. 13. Rio Petas, Bolivia, into Rio Paraguay. 16. Rio Boa Ventura, into Rio Guaporé. 21, 27. Posada, into Rio Guaporé, about 40 miles south of Villa de Matto Grosso. 26, 28. Bastos, Rio Alegre, into Rio Guaporé. July 8. Below Rio Paragahu, in Rio Guaporé. 23. Sixty miles above San Antonio de Guaporé. July 29-August 13. San Antonio de Guaporé. August 28. Rio Machupo, Bolivia, into Rio Guaporé. Twenty miles below San Joaquin. September 4-7. San Joaquin, Bolivia. Rio Machupo. Lake one mile west of town and mud-hole near town. 14, 15. Berlin, Rio Mamoré. 19. Rio Mamoré, below mouth of Rio Guaporé. 28. Guaja-ussu, Rio Madeira. 30. Palo Grande, Rio Mamoré. In rapids under stones. October 5. Villa Bella, Bolivia, Rio Beni, into Rio Madeira. 13. Cachoele de Theotônio, Rio Madeira. Whirlpools. 17. Cachoele de Ribeirão, Rio Madeira. 26. Cachoele de Girão, Rio Madeira. Whirlpools. November 2, 3. São Antonio de Rio Madeira. 15, 19, 25, 27-29. Manaos, mouth of Rio Negro. 30. Igarapé de Cachoeira Grande, two miles out of Manaos. December 2. Manaos. 4. Ten miles above Manaos on Rio Negro. 6, 8. Santarem, Rio Tapajos. 7. Swampy pools of Amazon and Rio Tapajos opposite Santarem. 9. Upper end of island, Amazon, four miles above Santarem. 10. Tapajos, in

hollow logs — Amazon, one mile above Santarem. 11, 19. Igarapé de Jrura entering Rio Tapajos, two miles above Santarem. 12. Igarapé de Maica, four miles below Santarem. 14. Tapajos in front of Santarem. 15. Island in Amazon, three miles above Santarem. 20. Rio Tapajos at Santarem. 21. Amazon. Half-way between Santarem and Para. 24. Para market. 27. From Gran Para between Belem and Salinas. 29. Bragança, Rio Caete. 16 kilometers from ocean, 162 from Para. *January 1, 1910.* Salt water, mouth of Rio Caete. 10. Alcobaca, Tocantins. Below first falls. 15-22. Para market.

#### THE GUIANA EXPEDITION.

The joint Expedition of the Indiana University and the Carnegie Museum, led by myself, collected in British Guiana, between September 9 and December 1, 1908. A detailed account of the results of this Expedition is published as volume 5 of the Memoirs of the Carnegie Museum. The localities, enumerated from east to west are:—Maduni Stop-Off, Lama Stop-Off, Cane Grove Corner, the Georgetown Trenches, Morawhanna, Mora Passage, and Koriabo and Issorora Rubber Plantations, all in low tidal land; Christianburg, Wismar, and Malali, the latter about one hundred miles from its mouth, on the Demerara River and Bartica, Rockstone, Gluck Island, Crab Falls, Konawaruk, Warraputa Cataract, and Paekoo Fall, all on the middle course of the Essequibo River. A special effort was made to get a complete series from the Potaro River both above and below the seven hundred and forty-one foot Kaieteur Fall. Collections were made between October 6 and November 4, 1908, at Aruataima, Holmia, and Savannah Landing above the Kaieteur and at Shrimp Creek, Tukeit, Waratuk, Amatuk, Erukin, Kangaruma, Potaro Landing, and Tumatumari below the Kaieteur. Mr. William Grant my Indian guide sent in additional collections from the Rupununi and the Ireng Rivers. The first series of specimens of this Expedition is in the Carnegie Museum, the second series in Indiana University. Other series are in the Museum of Comparative Zoölogy, the U. S. National Museum, the Field Museum, Stanford University, the British Museum, the Museums at Amsterdam, Berlin, Vienna, and Georgetown, British Guiana.

#### THE GIMBEL EXPEDITION.

Through the generosity of Mr. Jake Gimbel of Vincennes, Indiana, Dr. Max Mapes Ellis and Dr. William M. Tucker were enabled to go to British Guiana primarily to gather material for a monograph of the Gymnotidae.<sup>1</sup>

<sup>1</sup>The gymnotid eels of Tropical America. Memoirs Carnegie museum, 1913, 6, p. 109-195, pl. 15-23.

They started from New York in August 1910 and went direct to Georgetown. After collecting in the Demerara and along the coast at Georgetown and conducting experiments in the regeneration on various species of the Gymnotidae they ascended the Demerara to canal Number Two. They went through the canal to a tributary of Hubabu Creek, descended to the Demerara and returned to Georgetown. They also ascended the Demerara to Wismar and crossed over to the Essequibo at Rockstone. After collecting on Gluck Island in the Essequibo and in a tributary of the Essequibo at the railway crossing between Rockstone and Wismar they returned to the coast.

#### THE COLOMBIAN RECONNAISSANCE.

Preliminary notes of my reconnaissance in Colombia have been published in Indiana University Studies 16 and 18. A detailed account will appear in the Memoirs of the Carnegie Museum. I entered Colombia at Cartagena in December 1911, and left from the same port in April 1912. From Cartagena I went to Soplaviento on the Dique and to Calamar on the Magdalena; from Calamar up the Magdalena River by steamer to La Dorado, collecting at various stopping places, Barbosa, El Blanco, Canaletal, Puerto Wilches, Peñas Blancas, Puerto Berrio. From La Dorado, the route was by rail to the upper part of the Magdalena, collections being made on the way at Honda, especially in Bernal Creek. The upper part of the Magdalena was followed to Girardot, where extensive collections were made. From Girardot, the route led first over the western rim of the plain at an elevation of about 8800 feet to Bogota, on an elevated plain among the eastern Cordilleras; collections were made on the plain near Chapinero, north of Bogota, and at Madrid, near the western margin of the plains of Bogota. A return was made to Girardot, from which *via* Chicoral to Quatro Esquinas, Ibagué, Toche, across the Quindio Pass of the central Cordilleras, at an elevation of 11,200 feet, to Boquia, Piedra Moler, and Cartago near the Cauca River. Up the Cauca Valley *via* Paila, Buga La Grande, Buga to Cali, collections being made at Paila and at Cali, and in the Cauca near Cali.

After collecting at Caldas (elevation of 3722 feet), the valley of the Dagua was descended, collections being made at Cisnero (1046 feet), at Cordova (120 feet), and in tide-water.

From Buenaventura, on the Pacific coast of Colombia, a steamer was taken up the San Juan River to Puerto Negria; thence a dugout carried the Expedition as far as Istmina; collections were made in both the latter places. From Istmina, after a ride of two hours up a little stream, and across the low

continental divide (elevation 300 feet above sea-level) the valley of the Atrato was entered near Tambo. By dugout to the settlement of Boca de Raspadura; thence the Raspadura River was followed into the Quito River, then the Quito River. Collections were made at Boca de Certegui and near the town of Quibdo, at the junction of the Quito River with the Atrato. From Quibdo, a steamer was taken to Rio Sucio, where additional collections were made. From Sucio, a steamer carried the Expedition back to the starting point at Cartagena.

These collections have been supplemented since my return by material collected by Manuel Gonzales, near Puerto Wilches, at Las Juntas on the Rio Bogota, in the province of Santander, and along the way from Bogota to Villavicencio. The first series of the specimens and the duplicates are in the Carnegie Museum, the second series in Indiana University.

#### THE LONDON-FISHER EXPEDITION TO COLOMBIA.

A second Expedition into Colombia was made possible by Mr. Hugh McK. Landon and Mr. Carl G. Fisher, of Indianapolis.

Mr. Arthur W. Henn and Mr. Charles Wilson, undergraduates in Indiana University, left in December, 1912. They landed at Tumaco, near the southwestern corner of Colombia. After devoting about a month's time to the Telembi River, a tributary of the Patia, they separated. Mr. Wilson went to the San Juan River, collecting in the Upper San Juan Basin, the Condoto River at Condoto, and in the San Juan River at Istmina and Tado of the Pacific side, and later on the Atlantic slope at Tambo, Raspadura, Boco de Raspadura, Managru, Quibdo, in the Atrato between Quibdo and Rio Sucio, and especially in the Truando River emptying into the Atrato near Rio Sucio.

#### THE LONDON EXPEDITION TO COLOMBIA AND ECUADOR.

Through the continued liberality of Mr. Hugh McK. Landon of Indianapolis, Arthur W. Henn was able to remain in South America and spend the time between February 15, 1913 and March, 1914 in collecting fresh-water fishes in Colombia and Ecuador.

He sailed from Tumaco, Colombia for Barbacoas on February 15th. From Barbacoas he went by packtrain to Tuquerres (10,090 feet), Ancuya (5000 feet), Los Llanos de Sandona (5000 feet), Tambo, Peñol, and to Guayabillo on the brink of the Cañon of the upper Patia. Descending to the Patia River, about

3000 feet collections were made above the mouth of the Guaitara. He returned *via* Pasto to Tuquerres and Barbacoas. He next descended the Rio Telembi to its mouth and ascended the Rio Patia and the Rio Magui, the first large tributary of the Patia above the Telembi to the village Payan.

Returning to Tumaco on the coast he went *via* Buenaventura to Puerto Negria, the head of steam navigation of the San Juan River. Drifting down the San Juan to the Rio Calima, the last large tributary of the San Juan from the east, he ascended the Calima, collecting in a small creek near its mouth, and at Boca de Guineo about thirty miles from the mouth of the Calima. After ascending the Rio El Guineo to a portage, he crossed over to the San Joaquin and descended it to Buenaventura.

He next went to Guayaquil from where several shorter excursions were made. The first of these lead to Naranjito. Collections were made south of Naranjito in a small creek Estero Verdes, a tributary of the Rio Chan Chan, and in a deep river, the Rio Barranca Alta. The second shorter trip from Guayaquil was to the small rivers at Chone and Portoviejo. The third trip took him to Daule, Santa Lucia, and Colimes on the Rio Daule. Returning to Daule he crossed over along a winding cut-off from the Rio Palenque to Vinces.

Returning to Guayaquil from Vinces, he went by rail to Quito, collecting *en route* at Huigra (4000 feet), Rio Bamba (9020 feet), Latacunga (9055 feet) and Quito (9375 feet). A short trip was made from Quito to Mindo (4108 feet). Later he went to El Angel (10,000 feet) and down the Rio Chota or Mira to Maria Luisa, the property of Sn. César Mena. Collections were also made in the Rio Chota at Guallupi (5,000 feet). He returned to Quito and later went *via* Angel by packtrain to Barbacoas and steamer to Tumaco.

By the various expeditions outlined above, collections have been obtained from most of the Pacific slope streams between Panama and Peru.

The first series of the specimens collected in the Landon Expedition is in Indiana University. Other series are in the Carnegie Museum, the Museum of Comparative Zoölogy, the U. S. National Museum, the Field Museum, and the Museum of Stanford University.

## CENTRAL AMERICAN EXPEDITIONS.

From time to time specimens have been secured by exchange with the Field Museum of Chicago. These had been collected by the late Dr. S. E. Meek in various parts of Mexico and Central America. Accounts of this material have appeared in various publications of the Field Museum.

In collaboration with Mr. S. F. Hildebrand, Dr. Meek was engaged at the time of his death on a report of the fishes of Panama. Mr. Hildebrand has completed the report in the Laboratory of Indiana University and has given me the opportunity to examine many of the specimens collected in Panama. Dr. Meek as the representative of the Field Museum, and Mr. Hildebrand, Director of the Beaufort Laboratory of the Bureau of Fisheries, as the representative of the Smithsonian Institution, spent two seasons in Panama to collect fishes. A report on their itinerary and on their collections has been published by the Field Museum (Field museum publication 191, zool. ser., 10, 1916, p. 217-374, pl. 6-32). They collected in various localities of the east-slope Chagres Basin, many of which are now covered by Gatun Lake, and in others of the Pacific slope Grande basin of the Canal Zone. In addition they collected in the basins of the Rio Chepo, and Tuyra of the Pacific slope, south of the Canal Zone, and in a few of the smaller rivers both north and south of the Canal Zone on both the east and west slopes.

## THE EXPEDITION TO GUATEMALA.

During January, February, and March of 1915, Mr. Newton Miller assisted by Messrs. E. B. Williamson, C. C. Deam, and Prof. J. Hines collected fishes at Tenedores, Los Amates, Algeria, Gualan, Zacapa, and El Raneho in the Motagua Basin of Guatemala. Additional collections were secured at Puerto Barrios and Santa Lucia. The first series of specimen is in Indiana University.

## THE CHARACIDAE.

- < *Dermopteres* DUMÉRIL, Zool. analytique, 1806, p. 146.  
 < *Salmonidi* RAFINESQUE, Indice littiol. Siciliana, 1810, p. 32.  
 < *Dermopteria* RAFINESQUE, Analyse nature, 1815, p. 87.  
 = *Characini* MÜLLER, Archiv. nat., 1813, **1**, p. 323.  
 = *Characinidae* MÜLLER, Monatsb. Acad. wiss. Berlin 1842.  
 = *Characins* (Characidae) AGASSIZ, Rept. Brit. assoc. adv. sci., 1844, p. 293.  
 × *Characins* VALENCIENNES, Hist. nat. poissons, 1848, **21**, p. 159.  
 < *Characina* VOGT, Zool. briefe, 1851, **2**, p. 150.  
 = *Characinidae* RICHARDSON, Encycl. Brit., 1856, ed. 8, **12**, p. 245.  
 × *Characinoides* BLEEKER, Enum. sp. piscium Archip. Indico, 1859, p. 31.  
 = *Characinidae* GÜNTHER, Cat. fishes Brit. mus., 1861, **5**, p. 278.  
 = *Characinidae* COPE, Proc. Amer. assoc. adv. sci., 1872, p. 333.  
 = *Characinidae* GILL, Arrang. fam. fishes, 1872, p. 16.  
 = *Citharini* FITZINGER, Sitzungs. Akad. wiss., Wien, 1878, **77**, p. 37.  
 = *Characinida* SCHMARDA, Zool., 1878, **2**, p. 377.  
 = *Characinidae* JORDAN AND GILBERT, Synop. fishes N. Amer., 1882, p. 254.  
 > *Characidae* GILL, Mem. Nat. acad. sci., 1893, **6**, p. 131. Proc. U. S. N. M., 1895, **18**, p. 206.  
 = *Characinidae* BOULENGER, Poissons bassin Congo, 1901, p. 132. Cambridge natural history. Fishes  
 1904, p. 575. Cat. freshwater fishes Africa, 1909, **1**, p. 174.  
 = *Characidae* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1909, **3**, p. 252; 1910, p. 420.  
 = *Characiformes* REGAN, Ann. mag. nat. hist., 1911, ser. 8, **8**, p. 15.  
 > *Characidae* REGAN, *Loc. cit.*  
 < *Erythroides* VALENCIENNES, Hist. nat. poissons, 1846, **19**, p. 480.  
 = *Erythriniidae* RICHARDSON, Encycl. Brit., 1856, ed. 8, **12**, p. 250.  
 > *Erythrinoidei* BLEEKER, Enum. sp. piscium Archipel. Indico, 1859, p. 31.  
 > *Erythriniidae* GILL, Ann. Lye. nat. hist. N. Y., 1858, **6**, p. 410. Mem. Nat. acad. sci., 1893, **6**, p. 131.  
 Proc. U. S. N. M., 1895, **18**, p. 206.  
 > *Erythriniidae* COPE, Proc. Amer. assoc. adv. sci., 1872, p. 333.  
 > *Erythrini* FITZINGER, Sitzungs. Akad. wiss. Wien, 1873, **67**, abth., p. 37.  
 > *Myletidae* ADAMS, Man. nat. hist., 1854, p. 108.  
 > *Gastroplecidiidae* REGAN, Ann. mag. nat. hist. 1911, ser. 8, **8**, p. 19.  
 > *Xiphosomatidae* REGAN, *Loc. cit.*, p. 20.  
 > *Anastomidae* REGAN, *Loc. cit.*, p. 20.  
 > *Hemiodontidae* REGAN, *Loc. cit.*, p. 21.  
 > *Cithariniidae* REGAN, *Loc. cit.*, p. 21.

## ZOÖLOGICAL POSITION.

The Characins are a family of Ostariophysi which, with the other families of this superorder, are now at their prime. They are the dominant family of fresh-water fishes in Tropical America and they play a prominent rôle in Africa.

The Ostariophysi, which include most of the fresh-water fishes of the world, are distinguished from all other fishes by the peculiar arrangement of a series of

ossicles for placing the air-bladder in communication with the auditory apparatus. The first four vertebrae are modified. The first vertebra lacks the superior arch which is replaced by the "*claustrum*" and "*scaphium*" of the Weberian apparatus; the principal ossicle of the series, the "*tripus*," is associated with the third vertebra consisting of the rib and parapophysis of the third vertebra. The "*intercalarium*," representing the neural arch of the second vertebra, is imbedded in the ligament extending from the tripus to the scaphium. Very frequently the air-bladder comes in close contact with the skin, forming a pseudotympanum above the pectorals. In the Characins the area is not unfrequently marked by a humeral spot, a gathering of pigment cells from contiguous areas. This spot may become shifted away from the tympanum. The air-bladder is usually connected with the intestine by a duct. The pectoral girdle is suspended from the skull by a long posttemporal; the mesoecoracoid is present and the ventral fins are abdominal.

The orders and suborders of the Ostariophysi may be separated by the following key:—

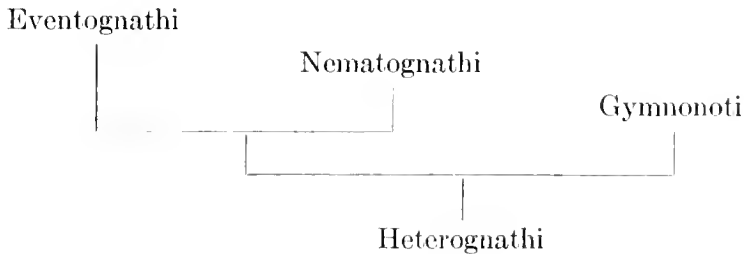
- a.* Maxillary bone usually a toothless vestige carrying a barbel; no subopercle or symplectic; no scales; supraoccipital and parietals coössified; mouth usually with teeth; ribs attached to transverse apophyses; skin naked or covered with bony plates. Usually an adipose dorsal.  
NEMATOGNATHI or SILUROIDEA.
- aa.* Maxillary usually well developed, not forming the base of a barbel, but sometimes one or more small barbels at or near its end; subopercle and symplectic present; parietals distinct from the supraoccipital; thoracic vertebrae without parapophyses; ribs mostly sessile; naked or with scales.  
PLECTOSPONDYLI or CYPRINOIDEA.
- b.* Lower pharyngeals falciform, parallel with the gill-arches; jaws toothless; brain-case produced between the orbits; basis cranii simple; two superior pharyngeals; mouth without teeth, more or less protractile; no adipose fin. . . . . (EVENTOGNATHI or CYPRINIFORMES).
- bb.* Lower pharyngeals not falciform; three basal branchiyls; basis cranii double, sometimes with myodome; one to four superior pharyngeals; mouth usually not protractile, usually with teeth.
- c.* Anus submedian; body variously shaped, never eel-shaped; dorsal and usually an adipose fin present; ventrals abdominal . . . . . (HETEROGNATHI or CHARACIFORMES).
- cc.* Anus at throat; body eel-shaped; dorsal absent, or reduced; ventrals absent. . . (GYMNONOTI).

The Eventognathi do not enter the Neotropical realm. The Gymnonoti are confined to it, the Heterognathi, as stated, occur in Africa and South America. The Nematognathi have an all but universal distribution.

Sagemehl (*Morphologische Jahrbüch*, 1884, 10) pointed out the similarity of the Erythrinoids to *Amia*, and suggested the derivation of the family from the Holostei and more particularly from the Cycloganoidea. Boulenger (Poisson bassin Congo, 1901) considers the Characidae, more particularly the Erythrins,



as the primitive Ostariophysi from which the Cyprinidae (Gymmonoti) and Nematognathi have been derived. These families seem to him to represent three states in the evolution of Teleosteans, the Cyprinidae and Siluridae being derived apparently from a common ancestor, very near the Characins, these latter ranging themselves to the holostean Ganoids through the Erythrins. Later Boulenger (*Cambridge natural history. Fishes*, 1904, p. 575) refers to them as "a very generalized type, although perhaps not directly derived from the bony Ganoids." The relationship recognized by him he represented as follows:



Rowntree (*Trans. Linn. soc. Lond.*, 1903, ser. 2, 9, p. 78) concludes his extensive account of the visceral anatomy of Characins with the following words:—"With the possible exception of the indications of a cellular air-bladder, there appears to be nothing in the visceral anatomy of the Characinidae which strengthens the deductions made from the skull as to the Amioid affinities of the group. In opposition to such deductions are especially the cystoarian ovaries, the asymmetric ductus pneumaticus, the presence of pyloric appendages and the absence of all trace of a valvular conus and of an intestinal spiral valve."

In view of the observations of every naturalist who has studied the Characins, notably Boulenger with the African species, and the author with the American forms, it is doubtful whether the similarity of the Erythrins with the Ganoids is anything more than one of the innumerable radial adaptations this plastic family has undergone.

#### RADIAL ADAPTATION.

Boulenger's remarks (*Poissons bassin Congo*, 1901, p. 132-135) concerning the African representatives may be translated as follows:—

This is a very natural family whose internal organization shows a great affinity with the Cyprinidae but whose exterior appearance, due to adaptation to various modes of life, varies so much that the beginner in African ichthyology will mistake its various representatives as near the Salmonids, pikes, and roaches of Europe. It is also impossible to state in a

few words the marks distinguishing the members of this family from such other fishes with abdominal ventrals and soft rayed fins as the Siluridae, Mormyridae, and Nototeridae. The presence of an adipose dorsal behind the rayed dorsal, although absent in some non-African genera, is a common character of the African fauna which it shares only with the Siluridae, which differ by their naked skin [one of the South American Characins is naked]. The Salmonids which also possess this adipose fin belong, on account of their general structure, to the same great group as the Clupeids which lack it and are strangers to Africa south of the Atlas.

One of the prime characters used in separating the Characinidae from its nearest related families is the structure of the mouth described as bordered by the premaxillaries in the middle and the maxillaries on the sides, while in the Cyprinidae and Siluridae the upper jaw is said to be bordered by the premaxillaries only. While this definition is valid for the most of the representatives of this family we must not forget, as Segemehl has impressed on us, that there are numerous exceptions which destroy the diagnostic value of this character. Thus the maxillary is so reduced in *Serrasalmo*, *Citharinus*, *Eugnathichthys*, *Phago*, being confined to the angle of the mouth that it is proper to question if this bone really forms part of the border of the mouth and very recently I have been able to determine that it is absolutely excluded in *Ichthyoborus* and *Neoborus*. On the other hand, among Siluridae (*Nematognathi*), whose premaxillaries are greatly reduced the mouth is bordered laterally by the maxillaries. *Chaca* has a large maxillary bordering the mouth, *Diplomystes* and *Eutropichthys* have a toothed maxillary, and among the Cyprinidae *Catostomus* shows us the premaxillary and maxillary together forming the mouth border. There are otherwise very great differences in the structure of the jaws among the fishes which are justly united in one family, the Characinidae. Thus the premaxillary, while never protractile, [I have since found *Bivibranchia*, a new genus, with protractile premaxillaries] is often vertically mobile (like the lower jaw), *Ichthyoborinae*; the maxillaries are either ankylosed to the premaxillaries or mobile on them, and in the majority of genera they do not directly articulate with the cranium, the only African exception being *Sarcodaces*.

The character given by other authors to distinguish the Characins from the Cyprinids, *i. e.* the non prolongation of the brain capsule between the orbits in the former is not more constant, for in *Citharinus* and *Xenoecharax*, for example, it extends forward to the nasal region. There are all degrees between this and the more usual one from which the objectionable definition is drawn. The orbitosphenoid, undivided and often membranaceous, forms a large interorbital septum in front of the cerebral cavity or below its anterior part. We have here an important character although it may not be constant, a specialization in this reduction of the anterior part of the basis cranii and in its replacement by a thin interorbital partition.

The presence of teeth in the jaws does not distinguish the Characins from the Cyprinids because both African and American genera lack them. The teeth vary enormously in structure and furnish valuable characters to distinguish numerous genera of this family. They are found on the premaxillary, the lower jaw, sometimes they are also present on the maxillaries. They are but rarely found on the palate and none of the African genera offer any examples.

The branchiostegal rays number only 3 to 5. There are four branchial arches. Pseudo-branchia are lacking or are rudimentary and glandular. The coracoid often forms a ventral ridge. The scapulars, epicoracoid, and postclavicle are distinct. The ventral rays number 10 to 13. The first pectoral, the dorsal, and anal rays are but rarely ossified and never form a formidable spine as in the Siluridae. Vertebrae in the African species vary from 17-33 + 13-24 = 33-57.

The scales, large or small, are ciliated in certain genera — a character very rare among the Physostomes. As Valenciennes says of *Distichodus*, the free part of the scales is truly ctenoid, the rest cycloid. The head always lacks scales, a rare thing in fishes. The lateral line organ is represented on the opercle by a branch from the suborbital.

The air-bladder is always divided into two parts by a constriction. The anterior part is much smaller than the posterior. In some, *Alestes*, the air-bladder may be prolonged along the right side of the hemapophyses and interneurals as far as the posterior end of the anal.

There are generally 10–25 coeca on the stomach and this number may be raised to 35 or 40 (*Hydrocyon*, *Citharinus*). The intestine in the carnivorous genera is short and makes but one loop; on the other hand, it is excessively long and with many windings in the herbivorous types.

In looking over this review of the characters of the family of Characins it is seen that there is none that taken alone and allowing for the exceptions, justifies its separation from the Cyprinids.

We are forced to content ourselves with a combination of characters, any one of which taken by itself is insufficient.

These words apply almost *verbatim* to the American members of the family.

The American Characins range from the border of the United States to some distance south of Buenos Aires. They form about one third of the entire South American fresh-water fauna and have diverged in adaptation to diverse food, diverse habitat, and diverse enemies to fill nearly every niche open to fishes. The ends of the three lines of adaptation to different food give us mud-eating forms, with long intestinal tract and no teeth,<sup>1</sup> flesh-eaters with shear-like teeth that are able to cut their way out of nets, attack large fishes, horses, and bathers, and conical-toothed forms with sharp, needle-like teeth and comparatively huge fangs. Greater diversity could scarcely be imagined, and one is led to suspect that some of the forms are *over-adapted*. In their divergence in form they have reached almost every conceivable shape, and have approached or paralleled many members of the diverse families of North American fresh-water fishes. Our shads and fresh-water herrings have their counterparts in *Elopomorphus*, *Potamorhina*, and *Psectrogaster*, our salmons are paralleled by *Salminus* and *Catabasis*, and our minnows by *Astyanax* and its relatives. It takes but a slight flight of the imagination to detect the striking similarity of *Luciocharax* to our gar pikes; our mullets are duplicated by *Prochilodus*; our top minnows are mimicked by *Nannostomus*. *Bivibranchia*, a recent discovery, shows a close similarity to *Albula*, and even our festive darters are duplicated by members *Characidium* of this most remarkable family.

This plasticity of the family in both America and Africa, and the *apparent* if not real duplication of forms in the two continents, is the more remarkable

<sup>1</sup> The toothless forms are not represented in Africa where members of the Cyprinidae replace them.

when we consider the very probable long separation of the African and American sections of the family, and that the present forms in Africa and America have probably independently evolved in the two continents from a common rudiment. As von Ihering first pointed out for animals in general, and as I have more particularly shown for the fishes, there has probably been no intermigration between the two continents since or previous to the early Tertiary.

Before the Tertiary von Ihering has postulated an Archhellenic continent between Africa and South America from which the two continents probably derived the ancestors of the Characins among other elements of the present fauna.

It is known that the Characins have inhabited South America since the early Tertiary at a time when the tropical part of the continents probably consisted of two islands, one occupying the Guianas, the other the plateau of eastern Brazil. From this small area and from the primitive group of Characins inhabiting it, the continent and family grew contemporaneously to their present proportions. They spread from these centers over the developing continent till they met unfavorable climatic conditions in the south, and high mountains or contestants in the north. They spread southward in decreasing numbers to and beyond the barren areas of Argentine to the edge of Patagonia, and they spread northward decreasing rapidly in numbers at Panama, only one of them reaching the United States, three southern Mexico, and three the Motagua River.

In South America they have always flourished, their only competitors in the rivers of the growing continent being the indigenous fishes contemporaneously developing from similar small rudiments. They have never been hampered or affected by intrusive elements. Their territory has from the first been unapproachable to foreign fresh-water fishes, and the marine species that have acclimated themselves have not diverged to any extent from their marine relatives.

The African section, on the other hand, came into competition with emigrants from India, and, according to Boulenger, the affinity of the entire African fauna with Asia, "is much greater than with America which is emphasized by the fact that the genera in the two first named regions are identical, while America possesses genera very closely related but not identical with those of Africa."

The American Characins have diverged, as stated before, in the most amazing manner in almost all possible ways towards diverse forms assumed by fishes. Some are long and slender, some nearly as deep as long, some spindle-shaped, others compressed. It is, however, in the teeth and alimentary canal that we find the greatest diversity, as has already been pointed out, and as will be

described in detail. The fact that different authors have associated different members of the Characidae with the herring, trout, cyprinids, and poeciliids indicates in a measure their versatility.

## LITERATURE.

The earliest observations on Characins are recorded on some ancient monuments of Egypt. Heckel (Die fische Aegyptens chronologisch der zeitfolge ihrer ersten und späteren wissenschaftlichen kenntnissnahme nach geordnet, p. 213 of Abbildungen und beschreibungen der fische Syriens, 1843) identifies *Distichodus niloticus* and *Citharinus geoffroyi* from mural decorations of graves near the Pyramids. Boulenger (Fishes of the Nile, 1907, p. 156) finds that *Citharinus citharus* Geoffroy is represented on the mural paintings of the tombs at Giza and Sapara, at Deir el Gebrawi, and on the tomb of Ti at Sakkara.

The American Characins were first brought to the notice of naturalists by Maregrav, who, in 1648 in his *Historiae rerum naturalium Braziliae*, 4, described the following:—

Curimata, p. 156	= <i>Prochilodus argenteus</i> (Agassiz).
Tareira do Rio, p. 157	= <i>Hoplias malabaricus</i> (Bloch).
Piraya, p. 164	= <i>Pygocentrus piraya</i> (Cuvier).
Maturaque, p. 169	= <i>Hoplias malabaricus</i> (Bloch).
Piabucu, p. 170	= <i>Piabucus dentatus</i> (Koelreuter).
Piaba, p. 170	= An <i>Anostomus</i> (?)

Ten years later, in 1658, Piso followed this account in his *Historiae naturalis et medicæ Indiae Occidentalis libri quinque*, which is but a second edition of the former work, with figures and descriptions of the same species:—

Piabucu, p. 66, Piaba, p. 67, Maturaque, p. 67, Tareira II do Rio, p. 68, Piranha, p. 69, Curimata, p. 70.

The detailed history of the African section of the family will not be given here.<sup>1</sup> The number of known African species is far smaller than the number of American species which exceeds six hundred.

In Seba's *Locupletissimi verum naturalium thesauri accurata descriptis*,

<sup>1</sup> Boulenger (Fishes of the Nile, 1907, p. 117) indicates that the *Salmo niloticus* Linné, Syst. nat., ed. 12 is not the *Salmo niloticus* of Hasselquist. The date, 1757, of Hasselquist, however, being pre-Linnean, the name *Salmo niloticus* must be applied to the species of Linné ed. 10. The *S. niloticus* of the Systema ed. 12, which is the same as that of ed. 10, is, according to Boulenger, identical with *Myletes baremose* Joannis, and the latter = *Alcetes baremose* of Boulenger, p. 117, should stand as *Myletes niloticus*. Further according to Boulenger, p. 141, the *Salmo niloticus* of Hasselquist is *Salmo acgyptiacus* of Gmelin. The name *Salmo niloticus* being a synonym of *Myletes niloticus* cannot be used for any other species and the oldest name after Hasselquist should be applied to his species. This oldest name is *Salmo acgyptiacus* and since this is a *Distichodus* the species should be *Distichodus acgyptiacus* instead of *Distichodus niloticus* as given by Boulenger, p. 141.

1758, over the signature of Artedi, but according to Gill<sup>1</sup> by another author, the name *Tetragonopterus*, coined by Klein and originally intended for entirely different fishes, was applied to the species now known as *Tetragonopterus argenteus*.

In 1754 and 1756 Gronovius in his *Museum ichthyologicum* defined the following genera:—

*Charax*, 1754, p. 19.

*Gasteropelecus*, 1756, p. 7, pl. 7, fig. 5.

*Anostomus*, 1756, p. 13, pl. 7, fig. 2.

*Erythrinus*, 1756, p. 6, pl. 7, fig. 6.

The two species referred by Gronovius to *Charax* were subsequently incorporated in the genera *Charax* (*gibbosus*) and *Astyanax* (*fimaculatus*). The *Gasteropelecus* is the *Gasteropelecus sternicla* of present authors. His *Anostomus* is *Anostomus anostomus* and *Erythrinus* is *Erythrinus salmoneus*. In 1777 Scopoli (*Introductio ad historiam naturalem* \*\*\*) adopted these genera into the binomial system with Gronovius species as the types.

Linné abandoned all of these genera and distributed the species known to him in the genera *Clupea*, *Cyprinus*, and *Salmo*. The species described or recognized by Linné in his tenth and twelfth editions and in Gmelin's the thirteenth edition of the *Systema Naturae* are given in the following table modified from that of Gill (*Proc. U. S. N. M.*, 18, p. 213):

	1758		1766		1788		
	Page	No.	Page	No.	Page	No.	
<i>Salmo argentinus</i> <sup>2</sup>		2	511	12	1372	12	<i>Piabucus dentatus</i>
<i>gibbosus</i>	311	19	513	20	1384	20	<i>Charax gibbosus</i> .
<i>notatus</i>			513	21	1385	21	<i>Astyanax fasciatus</i>
<i>bimaculatus</i>	311	20	513	22	1385	22	<i>Astyanax bimaculatus</i>
<i>immaculatus</i>	312	21	513	23	1385	23	(?)
<i>cyprinoides</i>			514	25	1385	25	<i>Curimatus cyprinoides</i>
<i>niloticus</i>	312	22	514	26	1386	26	<i>Myletes niloticus</i>
<i>aegyptiacus</i>					1386	49	<i>Distichodus aegyptiacus</i> & <i>rostratus</i>
<i>pulexulentus</i>	312	23	514	27	1386	27	<i>Astyanax</i> ?
<i>rhombus</i>			514	28	1386	28	<i>Serrasalmo rhombus</i>
<i>anostomus</i>	312	24	514	29	1387	29	<i>Anostomus anostomus</i>
<i>Clupea sima</i> <sup>3</sup>	319	6	524	7	?	?	
<i>sternicla</i>	319	7	524	3	1384	48	<i>Gasteropelecus sternicla</i>
<i>Cyprinus cephalus</i> part?	322	7	527	7	1417	6	<i>Erythrinus cephalus</i>
<i>dentex</i>	325		531	26	1383	47	<i>Myletes dentex</i> & <i>barramose</i>

<sup>1</sup> *Proc. U. S. N. M.*, 1895, 18, p. 225-227.

<sup>2</sup> The generic names are those used in the tenth edition.

<sup>3</sup> *Clupea sima* is credited to Asia by Linné. It is placed in the synonymy of *sternicla* by Bloch, p. 418. I know nothing further about it.

The total number of species known to Linné is thus seen to have been from eight to ten in 1758 and from twelve to fourteen in 1766, to which but a single species had been added at the time of the publication of the 13th edition in 1788. Linné apparently knew none of the species described by Maregrav except Maregrav's *piabucu* which is *Salmo argentinus* Linné.

In 1794 Bloch in his *Ausländische fische* added a number of species without, however, recognizing any distinct Characinid genera.

In Schneider's edition of Bloch's *Systema ichthyologiae* published in 1801 the following species were recognized: —

- Synodus malabrieus* Bloch, p. 397. (tafel 392 of Bloch).
- Synodus erythrinus* Bloch & Schneider, p. 397.
- Synodus tarcira* Bloch & Schneider, p. 398, pl. 79.
- Synodus palustris* Bloch & Schneider, p. 398.
- Salmo friderici* Bloch, p. 403. (tafel 378 of Bloch).
- Salmo fasciatus* Bloch, p. 403. (tafel 379 of Bloch).
- Salmo argentinus* Linné, p. 403. (tafel 382, fig. 1 of Bloch).
- Salmo rhombeus* Linné, p. 404. (tafel 383 of Bloch).
- Salmo falcatus* Bloch, p. 404. (tafel 385 of Bloch).
- Salmo odoe* Bloch, p. 405. (tafel 386 of Bloch).
- Salmo pulverulentus* Linné, p. 406.
- Salmo dentex* Linné, p. 407.
- Salmo edentulus* Bloch, p. 412. (tafel 380 of Bloch).
- Salmo melanurus* Bloch, p. 412. (tafel 381, fig. 2 of Bloch).
- Salmo unimaculatus* Bloch, p. 412. (tafel 381, fig. 3 of Bloch).
- Salmo bimaculatus* Linné, p. 413. (tafel 382, fig. 2 of Bloch).
- Salmo anastomus* Linné, p. 414.
- Salmo niloticus* Linné, p. 414.
- Salmo cyprinoides* Linné, p. 414.
- Salmo eurimata* Bloch & Schneider, p. 417.
- Salmo aegyptius* Gmelin, p. 418. (*aegyptiacus* of Gmelin).
- Salmo gasteropelecus* Gmelin, p. 418.
- Salmo immaculatus* Linné, p. 419.
- Salmo gibbosus* Linné, p. 419.

In 1802 Lacépède (*Histoire naturelle des poissons*) created for *Salmo rhombeus* Linné the genus *Serrasalmo* and adopted the *Charax* of Gronovius as *Characinus* for *piabuca*, *dentex*, *gibbosus*, *notatus*, *bimaculatus*, *immaculatus*, *cyprinoides*, *niloticus*, *nefasch*, *pulverulentus*, *anostomus*, *friderici*, *fasciatus*, *melanurus*, and *odoe*. The real advance in our knowledge of the relationships of the Characins did not begin until several years later when Cuvier (1817) published his *Règne animal*, and a series of articles in the *Memoires Museum d'histoire naturelle*. In the *Règne animal* (p. 174) he recognized *Erythrinus* which he placed in his *Clupes* and the following genera which were included in

the family of Salmones: — Characinus, Curimatus, Anostomus, Serrasalmo, Piabucus, Tetragonopterus, Myletes, Hydrocynus, Citharinus, and Gasteropelecus.<sup>1</sup>

In 1829, *Memoires Museum d'histoire naturelle*, 4, he further defined *Chalceus* and in 1819, 5, apparently substituted *Hydrocyon* for *Hydrocynus*. A great advance towards a knowledge of the South American Characinid fauna was made by Spix and Agassiz in the *Selecta genera et species piscium Brasiliensis*, 1829. They defined *Prochilodus* Agassiz (= *Pacu* Spix), *Anodus* Spix, *Leporinus* Spix, *Schizodon* Agassiz, *Salminus* Agassiz, *Hiphorhynchus* Agassiz (= *Acestrorhynchus* Eigenmann), *Rhaphiodon* Agassiz (= *Cynodon* Spix), and *Xiphostoma*; they also described many new species.

Up to this time and for several years later the Characins were distributed among the Salmonids and Clupeids and the peculiar parallelism between some of the genera of these families and the genera of the Characidae made such an association seem natural. In 1842 Johannes Müller in his treatise on the air-bladder of fishes (*Monatsb. Acad. wiss., Berlin*, June 1842 and *Arch. anat. u. phys.*, 1842, p. 307) described the genera *Macrodon* (= *Hoplias*) and *Hemiodus* and united all of the Characins in his new family Characinidae.

In 1844 Müller and Troschel published a synopsis of the known genera (*Wiegmann's archiv*, 1844, 1, p. 81) and defined the new genera *Chilodus*, *Distichodus*, *Alestes*, *Brycon*, *Exodon*, *Epieyrtus*, *Hydrolycus*, *Pygocentrus*, *Pygopristis*, *Catoprion*, and *Myleus*. They followed this in 1845 by the first monograph on the Characinidae, *Die familie der Characinen* (*Horae Ichthyologicae*, 1, 2). Here all of the then known genera, including the new genus *Agoniates* are described and the known species enumerated. This work by Müller and Troschel was up to that time by far the most important as well as the most comprehensive work on the Characins. It is the first of three general accounts that have appeared. In it were recognized thirty-one genera and eighty-eight species. Of these twenty-seven genera and eighty species were American, the remainder African.

Müller and Troschel's work was closely followed by the second revision of the group. Cuvier and Valenciennes in the 19th (1846) and 22nd (1848) volumes of their *Histoire naturelle des poissons* described many species and the genera *Lebiasina* and *Pyrrhulina*, 19 and *Parodon*, *Piabucina*, *Tometes*, *Mylesinus*, *Chaleinus* and *Cynopotamus*, 22. A retrograde step was taken in rejecting the Characinidae and including the genera in the Salmonidae.

<sup>1</sup> *Gasteropelecus* is attributed to Bloch.



In 1854 Girard (Proc. Acad. nat. sci. Phil., 6, p. 199) described the genus *Cheirodon*, the first Characine reported from the Pacific slope of America. This genus was afterward found to be widely distributed on the eastern slope.

In the same year Baird & Girard (Proc. Acad. nat. sci., Phil., 7, p. 27) described *Astyanax argentatus*, the only species that reaches the United States and the first to be recorded of the overflow from South America northward.

The notable work by Castelnau, (1855) Exped. Amerique Sud. Poissons, while containing many figures and description of species added nothing to our understanding of the relations of the various members of the family.

In 1858 Gill published (Ann. Lye. nat. hist., N. Y., 6) a short paper on the fresh-water fishes of Trinidad. In it he recognized *Erythrinus* and *Macrodon* as forming a distinct family and described a new subfamily, *Stevardiinae*. He also established the genera *Poecilurichthys* and *Hemigrammus*.

In the following year (1859) appeared a very important contribution to the knowledge of the Characins, *Zur familie der Characinen*, by Kner. He defined the new genera *Microdus*, *Rhytiodus*, and *Bryconops* and described and figured a large number of new species from various parts of South America. *Erythrinus* and *Macrodon* are excluded from the Characidae on account of the absence of an adipose fin. The same author (1863) defined the genera *Pseudochaleus*, *Chalcinopsis*, and *Saecodon*, the latter in connection with Steindachner who has since contributed so much to the knowledge of tropical American fishes. In the same year Günther defined the genus *Crenuchus*.

In 1864 we have the culmination of an epoch in the history of the Characins. Before 1802, at least during the binomial period, naturalists concerned themselves altogether with the description of new species. Beginning with Lacépède, in 1802, we have a series of descriptions of new genera by Cuvier, Spix, Agassiz, and Müller. To this period belongs the work of Cuvier and Valenciennes although it appeared later. In 1844 and 1845 we have the first attempts by Müller and Troschel of a philosophic review of the material that had been accumulated. All subsequent work was tinged by Müller and Troschel's *Die familie der Characinen*. In 1864 was published the second revision of the family. Cuvier and Valenciennes's work being an enumeration, or descriptive catalogue, rather than a revision, and Kner's works being confined to American species. Günther, in the Catalogue of the fishes of the British Museum, 1864, 5, reunited the Erythrinidae with the Characinidae. He defined or used for the first time the generic names *Caenotropus*, *Brachyalestes*, *Cretochanes*, *Hemibrycon*, *Seissor*, *Creagrutus*, *Anacyrtus*, *Roestes*, *Roeboides*, *Hystriodon*,

Sarcodaces, Oligosargus, and Ichthyborus. Günther recognized in all forty-seven genera and two hundred and five species. Of these forty genera and one hundred and eighty-one species are American.

Günther groups the genera in a number of subfamilies whose characters are largely the presence or absence of an adipose fin, perfection or imperfection of dentition, the length of the dorsal fin, and the character of the gill-openings.

The following synopsis will indicate his subfamilies and the characters on which they are based:—

- a.* Adipose fin absent.....*Erythrinina*,<sup>1</sup> American.
- aa.* Adipose fin present
  - b.* Dentition imperfect
    - c.* Dorsal fin short.....*Curimatina*, American.
    - cc.* Dorsal fin rather long.....*Citharinina*, African.
  - bb.* Dentition well developed
    - d.* Dorsal fin short
      - e.* Gill-openings narrow, the gill-membrane grown to the isthmus
      - f.* Elements of the jaws separate
        - g.* Nasal openings remote from each other.....*Anostomatina*, American.
        - (gg.)* Nasal openings close together.....*Nannocharacina*, African).
      - ec.* Gill-openings wide, the gill-membrane not grown to the isthmus.
        - h.* Teeth compressed, notched, or denticulated.
          - Tetragonopterina*, American and African.
        - hh.* Teeth all conical.....*Hydrocyonina*, American and African.
      - (ff.)* Both jaws very movable, their lateral halves being united into one piece.
        - Phagonina*, African).
- dd.* Dorsal fin rather long
  - i.* Gill-openings of moderate width, the gill-membrane being attached to the isthmus.
    - Distichodontina*, African.
  - ii.* Gill-openings wide, the gill-membrane not being attached to the isthmus.
    - j.* Belly rounded; jaws with conical teeth....*Ichthyborina*, African.
    - jj.* Belly rounded; canine teeth none...*Crenuchina*, American and African.
    - jjj.* Belly with a spinous serrature.....*Serrasalmonia*, American.

Günther immediately (1865) added the Phagonina and shortly afterwards (1867) the Nannocharacina from Africa, assigning the latter to a place between the Anostomatina and the Tetragonopterina. Both are included in parentheses in the foregoing synopsis.

Günther's work stimulated exploration and description to a great extent, and following the publication of his Catalogue we have contributions by Günther himself between 1864 and 1900; by Gill 1864–1903; Reinhard 1866; Cope between 1870 and 1894; Lütken 1874–1890; Steindachner 1875 to the present; Boulenger from 1887 to the present; Eigenmann and Eigenmann from 1889 to the present; Garman 1890–1895; Perugia 1891–1897; von Ihering 1893 to

<sup>1</sup> Including the Stevardiinae of Gill.

the present; Berg 1895–1901; Lahille 1895 to the present; Ulrey 1895; Regan 1900 to the present; Meek 1885–1916; Fowler; Nichols; Hildebrand and Mrs. Marion Durbin Ellis.

The discovery of the numerous species and genera since 1864 are too complicated for detailed enumeration. Reinhard and Lütken considered chiefly the species inhabiting the basin of the Rio das Velhas a tributary of the Rio San Francisco, Central America and Trinidad. Cope, 1870–1878, dealt largely with species of the Upper Amazons, and later with species from Rio Grande do Sul. Steindachner has published descriptions of numerous new species, collected by Agassiz and his associates during the Thayer Expedition and in part by himself and correspondents. Boulenger has reported on numerous collections received by the British Museum from different parts of South America. Eigenmann and Eigenmann have reviewed the Erythrininae and Curimatinae; Garman has published critical revisions of a few genera; Ulrey has reviewed parts of the Tetragonopterinae. Perugia reported on various collections received by the Museum of Genoa. Regan is describing species from the collections of the British Museum and Holmberg, von Ihering, Senior and Junior, Berg, Lahille, Ribeiro, and Goeldi were the first of a group of resident naturalists who have made important observations on their own faunae, chiefly eastern Brazil and Argentina. While many of the authors suggest modifications in parts of the system proposed by Günther, only Eigenmann and Regan concerned themselves with the broader questions of the classification of the Characins.

In 1884 Sagemehl demonstrated the close relationship of the catfishes, electric eels (Gymnotidae), Cyprinidae, and Characidae, all of which he grouped, on account of the common possession of the complicated Weberian apparatus, in the superorder Ostariophysi. Further studies on the anatomy of the Characins were published in 1903 by Rowntree.

Gill, in 1893, (Families and subfamilies of fishes) admitted the two families of Heterognaths, Characinidae, and Erythrinidae. He had defined these in 1858 and redefined them in 1895 (Proc. U. S. N. M., 18) when he intimated the existence of a third family, the Citharinidae. Together with Müller and Troschel and Kner he considers that the Characinidae, even after the exclusion of the Erythrinidae, "constitute a heterogenous group." Gill recognizes the subfamilies Erythrininae, Pyrrhuliminae, Lebiasininae, Tetragonopterinae, Serrasalmoninae, Hydrocyoninae, Myletinae, Distichodontinae, Anostominae, Curimatinae, and Citharininae.

In a recent paper (Cambridge natural history. Fishes, 1904) Boulenger while recognizing that "The classification of the family is still in an unsatisfactory state" divides them into the following groups (hardly deserving the rank of subfamilies)":—

- A. Erythrininae.....American.
- B. Hydrocyoninae.....African and American.
- C. Serrasalmoninae.....American
- D. Ichthyoborinae.....African.
- E. Xiphostominae.....American.
- F. Anostominae.....American.
- G. Hemiodontinae.....American.
- H. Distichodontinae.....African.
- I. Citharininae.....African and American.

Regan (Ann. mag. nat. hist., 1911, ser. 8, 8) comes to quite different conclusions in regard to the "groups" of Boulenger. He divides his Characiformes, *i. e.* the Heterognathi of authors, into six families (a) the Characidae which equals the Erythrininae, Hydrocyoninae, and Serrasalmoninae of Boulenger, (b) the Xiphostomatidae = Xiphostominae of Boulenger, (c) the Anostomidae = Anostominae of Boulenger *plus* Curimatus and Prochilodus, (d) the Hemiodontidae = Hemiodontinae of Boulenger, (e) the Citharinidae = Ichthyoborinae, Distichodontinae, and Citharininae exclusive of Curimatus and Prochilodus of Boulenger, and (f) the Gastroleceidae proposed for the flying Characins included in the Hydrocyoninae by Boulenger.

Regan's paper offers some criticism of my classification published in the Reports of the Princeton University Expeditions to Patagonia, 1909, 3, p. 253-256. In part I heartily agree with Regan, and long ago came to some of the conclusions reached by him. There are, however, many points in Regan's paper in which I think his conclusions are at variance with the facts. I reserve my criticism of Regan's strictures and a discussion of the general classification of the Characins until my study of all the subfamilies is completed. The keys of the subfamilies given in the Patagonian reports do not agree entirely with my present views. (*cf.* Rept. Princeton univ. expd. to Patagonia, 1909, 3, p. 253-256).

#### GEOGRAPHICAL DISTRIBUTION.

In the study of the Characins, as in that of all Tropical American fishes, the question of the distribution of the genera and species must in the future be among the first topics to be considered.

In 1891 and 1892 Eigenmann and Eigenmann enumerated all the known

Tropical American fishes. They (Proc. U. S. N. M., 14, 15) considered and summarized the distribution of the genera and species so far as known. They recognized sixty-five genera and about four hundred and sixty species, as compared with the forty genera and one hundred and eighty-one species enumerated by Günther (1864). It is not necessary to give here the details of the results of their inquiry into the geographical distribution of the species. It was found that nineteen of the genera recognized were distributed over the entire eastern slope of South America and that five of these had representatives in the La Plata and the Amazon, but not in the small rivers emptying into the Atlantic in southeastern Brazil. One genus, *Saccodon*, was confined to the Pacific slope. Twenty-seven genera were limited to the Amazons, or to the Amazons and the region north of it. The Guianas held two peculiar genera, the Rio Magdalena one, the southeastern coast streams one, while four genera had a wide but irregular distribution.

Many modifications in these summaries of distribution are necessary, both on account of the changes in the boundaries of the genera, and owing to the increase in our knowledge of the distribution of the several species. The papers published since the enumeration of 1891 and 1892 have dealt largely with the fauna of Paraguay, Rio Grande do Sul, Guiana, Colombia, and Mexico at nearly opposite ends of the range of the family and with the fauna of the Pacific slope of Ecuador.<sup>1</sup> A reconsideration of the entire problem of the distribution of the fresh-water fishes of South America may be found in The fresh water fishes of Patagonia and an examination of the *Archiplatá*-*Archhelenis* theory. (Reports of the Princeton university expeditions to Patagonia, 1909, 3, p. 225-374. Catalogue of the fresh-water fishes of tropical and south temperate America. *Ibid.*, 1910, 3, p. 375-512.

<sup>1</sup> While no attempt has been made to trace the details of the evolution of our knowledge of the African Characins the present account would be most inadequate and incomplete without reference to Boulenger's work on the Characins of the Congo and Nile Basins. The new genera and species from the Congo were described for the most part in volume 1 and 2 of the *Annales Musée du Congo*. A general account in which all the species were considered, formed part of his *Les poissons du bassin du Congo*, 1901. The Nile representatives are described and figured in his superb volume, *The fishes of the Nile*, 1907. Among other recent authors on the African Characins is J. Pellegrin, who is describing the material of the Paris Museum. Finally Boulenger (*Catalogue of the fresh-water fishes of Africa*, 1909, 1, p. 174-298) redefines the subfamilies and genera and redescribes all of the African species. He recognizes twenty genera and one hundred species.

## CHRONOLOGICAL LIST OF GENERIC NAMES.

<i>Original name</i>	<i>Date</i>	<i>Current Name</i>
Charax Gronow	1754 & 1777	
Erythrinus Gronow	1756 & 1777	
Gasteropelecus Gronow	1756 & 1777	
Anostomus Gronow	1756 & 1777	
Tetragonopterus Artedi	1758	
Characinus Lacépède	1802	
Serrasalmo Lacépède	1802	
Curimates Cuvier	1815	
Tetragonoptere Cuvier	1815	
Les Curimates Cuvier	1817	Curimatus
Les Anostomes Cuvier	1817	Anostomus
Les Piabuques Cuvier	1817	Piabuens.
Tetragonopterus Cuvier	1817	
Myletes Cuvier	1817	
Hydrocynus Cuvier	1817	
Citharinus Cuvier	1817	
Gasteropelecus Cuvier	1817	
Erythrinus Cuvier	1817	
Curimatus Oken	1817	
Piabucus Oken	1817	
Chalceus Cuvier	1818	
Curinata Cloquet	1818	
Hydrocyon Cuvier	1819	Hydrocynus
Anodus Spix	1829	
Prochilodus Agassiz	1829	
Leporinus Spix	1829	
Schizodon Agassiz	1829	Anostomus
Rhaphiodon Agassiz	1829	
Xiphostoma Spix	1829	
Pacu Spix	1829	Prochilodus
Cynodon Spix	1829	
Xiphorhynchus Agassiz	1829	Aceestrorhynchus
Salminus Agassiz	1829	
Macrodon Müller	1842	Hoplias
Hemiodus Müller	1842	
Chilodus Müller & Troschel	1844	
Distichodus Müller & Troschel	1844	
Alestes Müller & Troschel	1844	
Brycon Müller & Troschel	1844	
Exodon Müller & Troschel	1844	
Epiplatys Müller & Troschel	1844	Charax
Hydrolycus Müller & Troschel	1844	
Pygocentrus Müller & Troschel	1844	
Pygopristis Müller & Troschel	1844	
Catoprion Müller & Troschel	1844	

<i>Original name</i>	<i>Date</i>	<i>Current Name</i>
Myleus Müller & Troschel	1844	
Xiphorhamphus Müller & Troschel	1845	Acestrorhamphus
Agoniates Müller & Troschel	1845	
Grundulus Cuv. & Valenciennes	1846	
Lebiasina Cuv. & Valenciennes	1846	
Pyrrhulina Cuv. & Valenciennes	1846	
Parodon Cuv. & Valenciennes	1848	
Brycinus Cuv. & Valenciennes	1848	Alestes?
Piabueina Cuv. & Valenciennes	1848	
Tometes Cuvier & Valenciennes	1848	
Mylesinus Cuv. & Valenciennes	1848	
Chalcinus Cuv. & Valenciennes	1848	
Cynopotamus Cuv. & Valenciennes	1848	
Hydropardus Reinhardt	1849	Raphiodon
Cheirodon Girard	1854	
Astyanax Baird & Girard	1854	
Poecilurichthys Gill	1858	Astyanax
Hemigrammus Gill	1858	
Stewardia Gill	1858	
Corynopoma Gill	1858	Stewardia
Nematopoma Gill	1858	Stewardia
Microdus Kner	1859	Caenotropus
Rhytiodus Kner	1859	
Bryconops Kner	1859	
Ctenolucius Gill	1861	Luciocharax
Hydrocyonoides Castelnau	1861	Sarcodaces
Crenuchus Günther	1863	
Pseudochaleeus Kner	1863	
Chaleinopsis Kner	1863	Brycon
Saecodon Kner & Steindachner	1863	
Caenotropus Günther	1884	
Brachyalestes Günther	1864	
Cretochanes Günther	1864	
Hemibrycon Günther	1864	
Seissor Günther	1864	
Creagrutus Günther	1864	
Anacyrtus Günther	1864	Charax
Roestes Günther	1864	
Roeboides Günther	1864	
Hystriodon Günther	1864	Exodon
Sarcodaces Günther	1864	
Oligosargus Günther	1864	
Ichthyborus Günther	1865	
Phago Günther	1865	
Piabina Reinhardt	1866	
Characidium Reinhardt	1866	
Nannocharax Günther	1867	
Xenocharax Günther	1867	

<i>Original name</i>	<i>Date</i>	<i>Current name</i>
Aphyocharax Günther	1868	
Megalobrycon Günther	1869	Brycon
Stethaprion Cope	1870	
Holotaxis Cope	1870	
Plethodectes Cope	1870	Chalceus
Odontostilbe Cope	1870	
Laemolyta Cope	1871	
Nannaethiops Günther	1871	
Iguanodectes Cope	1871	
Nannostomus Günther	1872	
Bryconaethiops Günther	1873	
Leporellus Lütken	1874	
Curimatopsis Steindachner	1876	
Lütkenia Steindachner	1876	Stichanodon
Paragoniates Steindachner	1876	
Bramocharax Gill	1877	
Luciocharax Steindachner	1878	
Elopomorphus Gill	1878	
Potamorhina Cope	1878	
Metynnis Cope	1878	
Leptagoniates Boulenger	1887	
Psectrogaster Eigenmann & Eigenmann	1889	
Curimatella Eigenmann & Eigenmann	1889	
Semitapecis Eigenmann & Eigenmann	1889	
Henochilus Garman	1890	
Schizodontopsis Garman	1890	Laemolyta
Pseudocorynopoma Perugia	1891	
Bergia Steindachner	1891	Pseudocorynopoma
Chalcinopsis Holmberg	1891	Pseudocorynopoma
Neolebias Steindachner	1894	
Asiplonichthys Cope	1894	
Chorimycterus Cope	1894	
Diapoma Cope	1894	
Petersius Hilgendorf	1894	
Nanognathus Boulenger	1895	
Hoplerythrinus Gill	1895	
Eugnathichthys Boulenger	1898	
Paraphago Boulenger	1899	
Neoborus Boulenger	1899	
Micralestes Boulenger	1899	
Neolebias Boulenger	1899	
Catabasis Eigenmann & Norris	1900	
Mesoborus Pellegrin	1900	
Hemistichodus Vaillant & Pellegrin	1900	
Citharidium Boulenger	1902	
Gymnocharacinus Steindachner	1903	
Hoplias Gill	1903	
Anisitsia Eigenmann & Kennedy	1903	



<i>Original name</i>	<i>Date</i>	<i>Current Name</i>
Lahilliella Eigenmann & Kennedy	1903	
Holoshesthes Eigenmann	1903	Holoesthes
Holoprion Eigenmann	1903	
Holopristis Eigenmann	1903	Pristella
Markiana Eigenmann	1903	
Moenkhausia Eigenmann	1903	
Othonophanes Eigenmann	1903	
Bryconodon Eigenmann	1903	
Stichanodon Eigenmann	1903	
Evermannella Eigenmann	1903	Eucinopotamus
Acestrorhynchus Eigenmann	1903	
Acestrorhamphus Eigenmann	1903	
Acestrocephalus Eigenmann	1903	
Boulengerella Eigenmann	1903	
Gilbertella Eigenmann	1903	Gibertolus
Aenodon Eigenmann	1903	
Mylocollops Eigenmann	1903	
Piaractus Eigenmann	1903	
Orthomyleus Eigenmann	1903	
Colosoma Eigenmann	1903	
Mylosoma Eigenmann	1903	
Eucinopotamus Fowler	1906	
Ophiocephalops Fowler	1906	Hoplerythrinus
Copeina Fowler	1906	
Cyphocharax Fowler	1906	
Steindachnerina Fowler	1906	
Peltapleura Fowler	1906	
Eigenmannina Fowler	1906	
Chilomyzon Fowler	1906	Prochilodus
Hemiodopsis Fowler	1906	
Pithecocharax Fowler	1906	Anostomus
Poecilosomatops Fowler	1906	Characidium
Garmanina Fowler	1906	
Abramites Fowler	1906	Leporinus
Pellegrinina Fowler	1906	Chalceus
Coscinoxylon Fowler	1906	
Thoracocharax Fowler	1906	
Cyrtocharax Fowler	1906	Cynopotamus
Cynocharax Fowler	1906	
Sphyrænocharax Fowler	1906	Acestrorhamphus
Belonocharax Fowler	1906	Luciocharax
Waiteina Fowler	1906	Colosoma?
Reganina Fowler	1906	Colosoma?
Starksina Fowler	1906	Mylosoma
Sealeina Fowler	1906	
Evermannolus Eigenmann	1907	Eucinopotamus
Gilbertolus Eigenmann	1907	
Phenacogrammus Eigenmann	1907	

<i>Original Name</i>	<i>Date</i>	<i>Current Name</i>
Pogonocharax Regan <sup>1</sup>	1907	
Phoxinopsis Regan	1907	
Mimagoniates Regan	1907	
Ctenocharax Regan	1907	Grundulus
Eobrycon Jordan	1907	
Bryconamericus Eigenmann	1907	
Deuterodon Eigenmann	1907	
Phenacogaster Eigenmann	1907	
Astyanacinus Eigenmann	1907	
Fowlerina Eigenmann	1907	Ephippicharax
Joinvillea Steindachner	1908	Deuterodon
Coelurichthys Ribeiro	1908	
Gymnocorymbus Eigenmann	1908	
Thayeria Eigenmann	1908	
Ctenobrycon Eigenmann	1908	
Pristella Eigenmann	1908	
Psellogrammus Eigenmann	1908	
Hyphessobrycon Durbín	1908	
Brycochandus Eigenmann	1908	
Poptella Eigenmann	1908	
Champsoborus Boulenger	1909	
Anostomoides Pellegrin	1909	
Jobertina Pellegrin	1909	
Pterodiscus Eigenmann	1909	
Carnegiella Eigenmann	1909	
Holobrycon Eigenmann	1909	
Triurobrycon Eigenmann	1909	Brycon
Poecilocharax Eigenmann	1909	
Microcharax Eigenmann	1909	
Poecilobrycon Eigenmann	1909	
Archicheir Eigenmann	1909	
Hollandichthys	1910	
Nematobrycon Eigenmann	1911	
Knodus Eigenmann	1911	
Bivibranchia Eigenmann	1911	
Hasemania Ellis	1911	
Probolodus Eigenmann	1911	
Psalidodon Eigenmann	1911	
Spintherobolus Eigenmann	1911	
Glandulocauda Eigenmann	1911	
Hysteronotus Eigenmann	1911	
Vesicatrus Eigenmann	1911	
Apodastyanax Fowler	1911	Ctenobrycon.
Rhodsia Fowler	1911	
Parastremma Eigenmann	1912	
Genycharax Eigenmann	1912	

<sup>1</sup> This is probably a Cyprinoid from Ceylon not a Characin from South America.

<i>Original name</i>	<i>Date</i>	<i>Current name</i>
Gephyrocharax Eigenmann	1912	
Pterobrycon Eigenmann	1913	
Argopleura Eigenmann	1913	Bryconamericus
Microgenys Eigenmann	1913	
Zygogaster Eigenmann	1913	Astyanax
Ephippiecharax Fowler	1913	
Prionobrama Fowler	1913	
Gnathocharax Fowler	1913	
Tyttocharax Fowler	1913	
Xenurocharax Regan	1913	
Landonia Eigenmann	1914	
Phenagoniates Eigenmann & Wilson	1914	Phanagoniates
Microbrycon Eigenmann & Wilson	1914	
Ceratobranchia Eigenmann	1914	
Bleptonema Eigenmann	1914	Prionobrama
Pareebasis Eigenmann	1914	
Myocharax Fowler	1914	
Xiphocharax Fowler	1914	
Leptobrycon Eigenmann	1915	
Macropsobrycon Eigenmann	1915	
Megalamphodus Eigenmann	1915	
Microsehemobrycon Eigenmann	1915	
Oligobrycon Eigenmann	1915	
Aphyocheiroidon Eigenmann	1915	
Compsoura Eigenmann	1915	
Mixobrycon Eigenmann	1915	

## THE AMERICAN TETRAGONOPTERINAE.

Whether we regard the Heterognathis as a single family, or as several families, the fact remains that there are few groups of fishes within which the lines of evolution are so clearly portrayed by existing forms as in the Characidae. In order more satisfactorily to discuss their evolution I have divided the family into a large number of small groups of genera with undoubted affinity.

Several facts, aside from the general structure point to the Tetragonopterinae or perhaps the closely allied Cheirodontinae as the group nearest to the ancestral Characins.

1. Tetragonopterid fishes have been found fossil in the Tertiary fresh-water deposits at Taubaté.

2. They are found both in Africa and South America, the most nearly allied genera on the two sides, *Astyanax* and *Petersius*, are scarcely generically distinct. No other subfamily has representatives on both sides of the Atlantic.

3. They are the dominant groups both in Africa, where they form more than 36% of the Characins, and in America, where they form about 40%.

4. They are found over the entire area of distribution both in America and Africa. In America members of this subfamily form everywhere the vanguard in the distribution.

5. There are several lines of evolution diverging from the two subfamilies, Cheirodontinae and Tetragonopterinae.

Some of the lines of evolution radiating from different sections of the Tetragonopterinae, or the closely allied Cheirodontinae are minor lines that have not diverged greatly. For instance *Diapoma* and *Stevardia* are Tetragonopterids with modified opercles. The *Gymnocharacinae* are naked Tetragonopterinae. The *Crenuchinae* are apparently an offshoot from the Cheirodontinae. The *Stethaprioninae* have developed a predorsal spine but are otherwise very close to *Tetragonopterus* and especially to *Moenkhausia*. The *Mylinae* and *Serrasalmoninae* have possibly diverged from the *Stethaprioninae*, increasing the number of the dorsal rays, increasing the depth, compressing the ventral surface, and adding spines and emphasizing the dentition without much altering it. Another offshoot from the Cheirodontinae has given rise to a series of fishes with a decrease in the size of the mouth and the effectiveness of the

dentition. This series includes the Anastomatinae, Chilodinae, Prochilodinae, Hemiodontinae, Elopomorphinae, and finally, the toothless Curimatinae.

Another line diverging from the Cheirodontinae has given rise to the Salmininae, Characinae, Acestrorhamphinae, Cynodontinae, and ultimately the Hydrocyninae.

Another line of divergence from the Cheirodon or Tetragonopterus group led through the Bryconinae, Iguanodectinae, Pyrrhulininae, Piabuscinae, to the Lebiasininae. A side branch from this leads to the Chalcininae which points the way to the flying Gasteropelicinae. For the above reasons it seems best to begin the detailed examination of the species with the Tetragonopterinae.

It may be left an open question whether the African and American genera owe their similarity to convergence or to community of origin. They are for the most part small or minute fishes ranging from 50–200 mm. in length. *Myletes* in Africa reaches 460 mm. The Tetragonopterinae are closely related to the Cheirodontinae, Diapominae, Glandulocaudinae, Stethaprioninae, Bryconinae and to other subfamilies. In shape they vary from the fusiform *Cretochanes* to the deeply compressed *Tetragonopterus*. In the majority of the genera the mouth is small. The lower jaw is heavy, and on account of the obliquity of the mouth, when the mouth is opened it is thrown forward, so as to project beyond the snout; when the mouth is closed the teeth of the lower jaw usually fit in behind the innermost series of the premaxillary. In some genera from Africa there is an inner pair of conical teeth in the lower jaw. These appear *in lieu* of an inner series of teeth which in the American *Brycon* are still present on the sides of the lower jaw. Conical teeth like these appear in isolated (not closely related) genera of other subfamilies both in Africa and America, and, since they cannot be genetically connected, appear to offer an example of homoplastic development. The skull is smooth in cross-section or slightly grooved in the smaller specimens; two fontanels are well developed in all the genera but *Brycinus* of Africa. In this genus there is no frontal fontanel. The bridge between the fontanels is either flush with the surface or sunk beneath it; the occipital process varies directly with the depth of the species, and serves to bridge the space between the skull and first interneurals, *i. e.* the space over the coalesced vertebrae which lack interneurals. In the deeper species the process is curved or bent upward and is long, reaching as much as one third of the distance of its base from the dorsal. In the slenderest species it is short and insignificant. It is always grooved to its tip, the groove leading to the parietal fontanel.

The eyes are always large, the species depending largely on living and moving food. The cheeks may be narrow or deep and are one third or entirely covered by the second suborbitals.

The premaxillary teeth are always in at least two series. The inner series consists of from 4-12 graduated; three to many-pointed (a few may be conical) teeth arranged in a regular series. The outer row is very variable both in the group and in individual species and ranges from one or more teeth near the middle of the premaxillary, to a complete, compact series of teeth, narrower than those of the inner series in *Tetragonopterus*. If the outer row consists of four or more teeth the third tooth usually drops out of line and tends to form a third series of teeth. In *Moenkhausia melanogramma* the third tooth is entirely withdrawn from the line of the others. In the related *Brycon* in which the teeth are more numerous than in the genera of this subfamily, the fourth tooth and a few others also drop out of line and join the third tooth of the lower inner series which has moved forward. Other teeth of the inner series have also moved forward giving rise to a third series of teeth. A third series of teeth has independently arisen in *Creagrutus* and *Bryconops*, and in the *Bryconinae*.

The maxillary may have no teeth, or a few may be crowded along the part of the margin nearest to the premaxillary, or it may have conical or tricuspid teeth along its entire margin. Usually the variation in any one species is very limited, but in *Astyanax fasciatus nicaraguensis* there is a variation of from one to nine teeth in the maxillary.

The teeth in the lower jaw may all be alike and graduate, or the lateral teeth may be more or less abruptly smaller, the more abruptly the more probably the lateral teeth will be conical. The larger teeth, 3-6 in number, may form a nearly transverse series or be arranged in a curve.

The denticles of the individual teeth of the inner series of the premaxillary may be in a straight line, *i. e.*, the teeth may be strictly incisors or, the line joining the cusps may be more and more curved so that it will be U-shaped, the open part of the U forward. The teeth in the lower jaw are usually the reverse of those of the inner series of the upper jaw.

Gill-rakers are usually slender and not very long, they are all but absent in one genus, *Scissor*. The gill-membranes are free from each other, the nares close together. The breast is flat or rounded, never keeled. The scales are usually cycloid, rarely crenate or even ctenoid. They vary from 26 to about 60 in the lateral line, which is variously developed.

The caudal may be naked, the scales of the sides passing on to its base and

ending in slightly enlarged scales, or the scales may become minute on the caudal adhering and covering the lobes to a greater or less extent. The anal may similarly have simply a basal sheath or may be covered to near its tip with minute scales.

The scales may be regularly imbricate or in certain regions there may be interpolated rows. In some species there are but a few interpolated scales, *i. e.*, a single series becomes divided into two above the anal. The point of division becomes more and more removed from the anal and the number of divided series increases. In long slender species, or larger-scaled, deep species, there are no interpolated rows. In deep, many-scaled species they sometimes become numerous. Closely allied species or even varieties may differ in this respect. In *Astyanax fasciatus* individuals with interpolated series are rarely found except in the Rio Parahyba where the usual variety has been entirely replaced by one with interpolated series.

The dorsal is short, of between 9 and 12 rays, counting everything, and its origin is usually in the middle of the body. The adipose dorsal is small but almost always well developed. The caudal is always forked, the lobes equal or subequal, rarely markedly different. The anal is another variable element. Its origin usually below or behind the last dorsal ray may (*Psellogranus* and *Phenacogaster*) fall below its origin. Other things being equal the deeper species have the larger number of anal rays. The number of rays varies from 10 to 48.

The reach of the pectorals and ventrals varies with the shape of the fish. In deep species with long anal they overlap, in slender species they ordinarily do not reach each other. The notable exception to this is found in *Gephyrocharax*.

The alimentary canal varies but little from the entire length of the fish. There are a few pyloric coeca.

The air-bladders are large, the posterior about twice the length of the anterior, curved down behind in the deeper species.

The range of color is limited. In life the caudal of the male is frequently cherry-red, the dorsals and anal (and caudal in females) are frequently yellow. A shoulder-spot of varying shape is usually present. There is usually a silvery lateral band overlying a black band which becomes evident in formalin preparations. There is frequently a dark spot on the base of the caudal which is often continued on the middle caudal rays. In *Moenkhausia dichrouros* and *Bryconamericus exodon* the tips or bands across the caudal lobes are dark. In *Moenk-*

*hausia lepidurus* and the species of *Cretochanes* the middle rays and upper caudal lobes are black. In *Astyanax lineatus* and *A. steindachneri*, in *Moenkhausia latissimus*, and in *Hollandichthys* and *Pseudochaleeus* dark lines follow the spaces between successive rows of scales. The dorsal and anal are marked with black in a few species.

The points of greatest variability within a genus are: —

1. The depth and all that this carried with it, length of occipital process, rows of scales, number of rays of anal.
2. The size of the mouth and the dentition.
3. The degree of armature of the cheek.
4. The scaling of the caudal, anal, predorsal, and preventral areas.
5. The degree of development of the lateral line.

#### CONTRASTED GENERIC CHARACTERS.

The following mutually exclusive characters are found variously combined in different genera. The characters appearing in the largest number of genera are given in the first column.

A. Caudal fin naked.	a. Caudal scaled.
B. Lateral line complete.	b. Lateral line incomplete.
C. Maxillary with few teeth or none.	c. Maxillary with teeth along its entire edge.
D. Premaxillary teeth in two series.	d. Premaxillary teeth in three series.
E. Cheeks partly naked.	e. Cheeks entirely covered by the third sub-orbital.
F. Anterior edge of maxillary a simple curve.	f. Anterior edge of maxillary sigmoid.
G. Predorsal line scaled.	g. Predorsal line naked.
H. Teeth of the sides of the dentary abruptly smaller.	h. Teeth of the sides of the dentary graduated.
I. Premaxillary meeting the maxillary of an angle.	i. Maxillary-premaxillary border a simple curve.
J. Scales entire.	j. Scales ctenoid.
	j. Scales crenate.
K. Anal naked except at the base.	k. Anal scaled to near its tip.
L. Lateral line nearly straight.	l. Lateral line sharply decurved in front.
M. Preventral area with normal scales.	m. Preventral area with paired scales.
N. Gill-rakers setiform.	n. Gill-rakers lanceolate.
O. Adipose fin present.	o. Adipose fin wanting.
P. Origin of anal behind origin of dorsal.	p. Origin of anal under or in front of origin of dorsal.
Q. Caudal without glandular scales.	q. Caudal with glandular scales.

The characters appearing in the larger number of genera and given in the first column are all found in *Astyanax*, which may for that reason, be the central,



possibly the most primitive member, of the subfamily. *Poecilurichthys*, which differs from it only in having the character I instead of L, is scarcely distinguishable.<sup>1</sup>

The different characters of the first column are found in various combinations with most of the characters of the second column. Thus *A* is found in combination with all (not counting its contrasted character, *a*) except *k* and *l*. *B* is found in combination with all but *o* and *p*. *C* is found in combination with all the characters of the second column and the same is true of all the rest of the characters of the first column.

### POLYPHYLETIC CHARACTERS.

It is quite certain that the characters of the right-hand column of the contrasted generic characters have sometimes, at least, been independently derived from the characters of the left-hand column, not only by the different genera possessing the character, but sometimes by different species of the same genus. That is, some of the genera possessing characters given in the second column are of polyphyletic origin.

Beginning at the bottom of the list, the character *o* is found in *Hasemania* from southeastern Brazil, and in the very different genus, *Nematobrycon*, from the west of the western Cordilleras of Colombia. The two genera are not related, and are widely separated geographically. There can be no doubt but that they have independently lost the adipose fin.

The next undoubted case is that indicated by *g*. This character is found in *Poecilurichthys*, scarcely distinct from *Astyanax*, and in *Gymnocorymbus*, a very different fish. Here again the character has very probably been independently acquired by the two genera.

<sup>1</sup> In Indiana Univ. Studies, 1914, No. 20, I have tried to carry the inference a step further.

"The common possessions of all members of the Tetragonopterinae enumerated above, permit us to picture the ancestral type of the subfamily. In brief, it must have been a fish similar in most characters to *Astyanax fasciatus* Cuvier. This species, besides possessing all the characters common to all members of the subfamily, possesses also many of those positive (as contrasted with absent) characters enumerated for the family, and lacks some characters, like the highly specialized scaling of the ventral surface, ctenoid scales, extreme length of anal, extreme development of second suborbital, which are evidently highly specialized characters in a few of the genera. It is more widely distributed than any other species and has given rise to numerous variations.

It represents an average in length of head (4.3), depth, (2.6-3); length of anal (about 30); scales (about 38); size of eye (2.5-3); general shape (compressed subfusiform); position of dorsal (its base being in the space above the origins of the ventral and anal); size of mouth; and the characters of the teeth. The fossil fishes found at Taubaté — south of Rio de Janeiro — are similar to it in most characters. They are a little larger and may be members of the genus *Brycon*. In all but the teeth, they are very similar to *Astyanax fasciatus*."

The next case is that of *e*, the enlarged third suborbital. This character is found in *Knodus* with a scaled caudal and in *Creagrutus*, *Piabina*, and *Bryconamericus* with a naked caudal. The last three genera are undoubtedly closely related and for the present purpose count as one. *Knodus* is a *Bryconamericus* in all but its scaled caudal. We are, therefore, compelled to assume either that if the ancestors of *Knodus* had the caudal scaled, that it has paralleled *Bryconamericus* in the character of its cheek or that if its ancestors were identical with those of the latter genus that its caudal has independently acquired scales.

The case presented by the character *d*, three rows of premaxillary teeth, is much simpler and clearer. This character is found in *Microgenys*, *Creagratus*, *Piabina*, and *Bryconops*. It is quite certain that the latter genus has been derived from an ancestor like *Creatochanes* and that the others have been derived from an *Astyanax*-like ancestor. *Microgenys*, *Creagratus*, and *Piabina*, on the one hand, and *Bryconops* on the other, have independently acquired three series of teeth. In this case the steps by which this has been accomplished are indicated in a variety of species of the subfamily. In many species alternate teeth of the front series of the premaxillary are withdrawn from the line of the rest, thus forming an incipient third series. In *Moenkhausia melogramma* and in *Bryconamericus exodon* this process has almost yielded additional genera with three series of teeth. The modification from one to the other condition is a perfectly progressive one, without notable breaks or saltations.

The next character *c*, teeth along the entire maxillary, has again been independently derived from *C* several times. Here we have not only the evidence of several distinct, not closely related, genera which have the character but also the evidence from changing species. I have elsewhere called attention to some specimens referred to as *Astyanas aeneus nicaraguensis*. Of thirty-five specimens from Lake Nicaragua, there are nine with two teeth, two with three teeth, five with four teeth, five with five teeth, five with six teeth, five with seven teeth, three with eight teeth and one with nine teeth in the maxillary. The normal number is two. *Phenacogaster* is in a similar state of transition. *Pristella*, *Hemibrycon*, *Nematobrycon*, *Hollandichthys*, and *Pseudochalceus* have acquired complete dentition for their maxillaries in at least three independent groups.

The most interesting and conclusive evidence of the independent origin of the same character in different genera is presented by the character *b*, the incompleteness of the lateral line. Not only have we the evidence from widely divergent genera with this character, but we again have species in a state of true mutation. Most remarkable of all is one species of which I have been able

to examine hundreds of specimens from the Amazon, not one of which showed signs of mutation, while the specimens coming from another region are in an evident state of mutation.

Genera with a complete lateral line and the genera with an incomplete lateral line to which they have given rise are:—

<i>Genera with lateral line complete.</i>	<i>Genera with lateral line incomplete</i>
Tetragonopterus	none.
Entomolepis	none.
Moenkhausia	Hemigrammus (further changed into <i>Pristella</i> and <i>Thayeria</i> ).
Astyanax	Hyphessobrycon (into <i>Hasemania</i> ).
Knodus	none.
Markiana	none.
Gymnocorymbus	none.
Ctenobrycon	Psellogrammus.
Creatochanes	Brycochandus.
Bryconops	none.
Creagrutus	none.
Piabina	none.
Microgenys	none.
Bryconamericus	none.
Zygogaster	none.
Ceratobranchia	none.
Landonia	none.
Deuterodon	none.
Hemibrycon	Hollandichthys, Pseudochalceus, and Nematobrycon.
Phenacogaster	Vesicatrus.
Scissor	none.
Henochilus	none.
Psalidodon	none.

The deviation is so evident in a number of cases that the polyphyletic origin of the character *b*, an incomplete lateral line, is beyond the faintest shadow of a doubt.

Without considering sporadic individuals of otherwise constant species, the species which are undoubtedly mutating at the present time are *Hemigrammus inconstans*, *Moenkhausia cotinho*, *Phenacogaster beni*, *Astyanax mutator*, and *Hyphessobrycon poecilioides*. The details for these species are given under their descriptions. Another species which has crossed the line but has not reached a state of equilibrium is *Psellogrammus kennedyi*. Many of the details of this species are again given under the proper caption.

Of *Ctenobrycon haurxwellianus* I have been able to examine over fourteen hundred specimens from various places on the Amazon. In all of these the lateral line is complete. In at least six specimens out of nineteen from the Lagoa

Parnagua, Paranahyba basin, the lateral line "stutters." This species, in other words, is mutuating at Parnagua. *Moenkhausia cotinho* is similarly locally mutating and the same seems to be true of *Hyphessobrycon poecilioides* and *Astyanax fasciatus*.

The sealing of the caudal I am not able to cope with satisfactorily. It is certain that it has several times been acquired independently by different members of the family, if not by different members of the subfamily under consideration.

#### SELECTIVE GROUPING OF CHARACTERS.

Another line of inquiry leads us to consider whether the contrasted unit characters are entirely combined as if by chance or whether there is a selected combination. The characters from  $g$ - $q$  are found in but one or two genera and these may be omitted from the discussion since they would needlessly complicate it.

Taking only the first six pairs of contrasted characters, there are 62 or 64 possible combinations. Considering each combination a distinct genus we should have 64 genera, without considering the characters between  $g$  and  $q$ . In reality we have but about half as many.

Taking only the first three characters we should have eight possible combinations. An examination of the genera shows that six of these combinations are actually found, but not by any means in the same proportions. If we take the first four characters, each of which has probably several times, and independently, been modified into its contrasted character, these four pairs give us sixteen possible combinations. Of these only eight actually occur.

A certain amount of selective grouping is thus found, if we take only three contrasted pairs of characters, a greater amount of selective omission if we take four pairs and this increases rapidly as we increase the number of contrasted forms. It is evident that either many of the possible combinations have never arisen, or, having appeared, they have not been preserved.

#### POLYPHYLETIC GENERA.

In my paper, Indiana University Studies, 1914, no. 20, I wrote —

"This independent origin of characters is responsible for the fact that some of the accepted genera of the Tetragonopterinae are of polyphyletic origin, i. e. our definitions of genera are in many cases enumerations of characters frequently independently acquired, not enumerations of the characters of the ancestral type of the genus from which the species have diverged. A result of this independent divergence is that frequently in a restricted, isolated area the species of different genera represented in the area are more nearly related to each other than to members of their own genera in remote regions. For instance *Astyanax*

*festæ* and *Bryconamericus peruanus* of the Pacific slope of Ecuador are more intimately related than *festæ* is to *Astyanax anterior* of the upper Amazon. And in this case, *Astyanax brevirostris* or *Bryconamericus brevirostris* whichever it may be, is intermediate between the two. I am not competent to say whether *brevirostris* is moving from *Bryconamericus* to become an *Astyanax*, or whether it has just completed the reverse process. Certainly *festæ* and *brevirostris* are more intimately related, have had a common ancestor at a less remote time, than either of them with an *Astyanax* or *Bryconamericus* of southeastern Brazil.

We recognize two types of genera, one a group of closely related species, descended from a common ancestor and having certain distinguishing characters in common. Phenacogaster is such a genus. The peculiar scaling of the ventral surface has been developed but once; and the species are all closely allied, differing from each other in but a few characters. The other, a polyphyletic type, consists of species having a certain combination of definite characters in common which easily distinguish members of the genus, but which, instead of indicating a single ancestral line from which the species have diverged, are acquired possibly one at a time along distinct lines converging to a common definition. Sometimes the polyphyletic origin can be detected, sometimes not. *Bryconamericus* seems to me to be such a genus; *Hemibrycon*, *Deuterodon*, and the larger genera are probably also polyphyletic.

"Since it is difficult, or impossible, to say in any case which of the given characters has appeared first, it is extremely difficult to point out lines of evolution leading to different genera or species. We can only insist that certain innate possibilities may become actualities anywhere along the line, possibly wherever they may prove advantageous, though the advantage, to say the least, is not always obvious.

"We may be permitted to assume that the more frequent character is the primitive one, although this is certainly not always a safe assumption."

*Deuterodon* with the character *h* is a genus of polyphyletic origin. *Deuterodon iquape* is found in southeastern Brazil, *Deuterodon nasatus* in Central America. These two species technically belong to the same genus, genetically they are most certainly not derived from an immediate common ancestor and it is very probable that *Deuterodon pinnatus* and *Deuterodon potaroensis* from Guiana, and *Deuterodon acanthogaster* from the Paraguay, are also independent derivatives from the genus *Astyanax*.

A somewhat similar case is presented by a character not mentioned in the list, because I hesitate to propose a generic designation for it. It is this:—In the vast majority of the species of Characins, the innominate bone is feeble and entirely concealed. In *Deuterodon acanthogaster* and in *Astyanax mucronatus*, this bone has become firm and the anterior end projects out of the body as a distinct spine. There is no doubt whatever that this modification is arising independently in the two species.

It must be quite evident from the foregoing that the subfamily is a paradise for the student of divergent evolution. But the very conditions that make it of interest to the student of evolution make it the despair of the systematist whose object is to express relationship by grouping the species in an orderly array of genera and the individuals in an orderly array of species, always, if

possible, in the form of the conventional phylogenic tree. In order to better express the relationship of smaller groups of species the genera have been made as small as consistent with facts. The Tetragonopterinae seem to form an interlacing fabric rather than a branching tree. An illustration of the interest and difficulty is given by the series of genera Poecilurichthys, Ctenobrycon, Psellogrammus. The genus Poecilurichthys as here understood, grades insensibly into the genus Astyanax, and perhaps should have been retained united with the latter. Be that as it may, *P. spilurus* is much more closely related to *Ctenobrycon hauxwellianus* than it is to any species of either Poecilurichthys or Astyanax, and yet there is scarcely a technical character by which it can be separated from the remaining species of Poecilurichthys and united with Ctenobrycon. The latter is sharply distinguished by ctenoid scales from all other members of the subfamily. In another direction, the specimens of *Ctenobrycon hauxwellianus* from Paranagua form a complete bridge so far as the technical characters are concerned, between the genera Ctenobrycon and Psellogrammus. From the parental form, *P. spilurus*, the Amazonian *Ctenobrycon hauxwellianus* has become generically distinct. *C. hauxwellianus* in its turn, in Paranagua, is becoming and, in Paraguay, has developed the character which distinguishes Psellogrammus.

The difficulties of the systematist could of course be obviated by retaining all of these things in the single old genus Tetragonopterus, but this procedure would neither remove the facts nor explain them.

I have attempted to express the relationship of the genera by the accompanying diagram, in which Astyanax occupies the center, and in which it is made to appear that the scaled caudal has appeared once, of which I am not at all certain, and in which the line of the outer ellipse indicates the boundary within which the lateral line is complete. This boundary has been crossed many times and by different radiating lines.

Fig. 1.—The genera Astyanax, and Moenkhausia, within the central oval, are closely allied and the difference between them is partly bridged by the species *M. intermedia*. They are considered typical and central for the subfamily. From Moenkhausia have radiated directly Markiana, Gymnocorymbus, Tetragonopterus, and Entomolepis. It is left in doubt whether the genera Hemigrammus and Hyphessobrycon have diverged independently from Moenkhausia and Astyanax, and then converged till now only the scaled and naked condition of the caudal separate them, or whether they have been derived from one of the above and then developed or lost the caudal scales. The same applies to the genera Bryconamericus and Knodus. The species *Astyanax nuntator* and *Hyphessobrycon proteus* furnish bridges between Hyphessobrycon and Astyanax. *Moenkhausia cotinho* and *Hemigrammus inconstans* furnish a similar bridge between Hemigrammus and Moenkhausia. From Astyanax many lines have radiated, some of which have been continued beyond the line of the outer oval, which indicates that their lateral line has become broken. Where a bridge exists between the so-called genera this has been indicated by extending the name of the genus beyond its boundary or by supplying the name of the species which constitutes the bridge in brackets. The origin of two of the radial lines is uncertain, a fact indicated by an interrogation point.

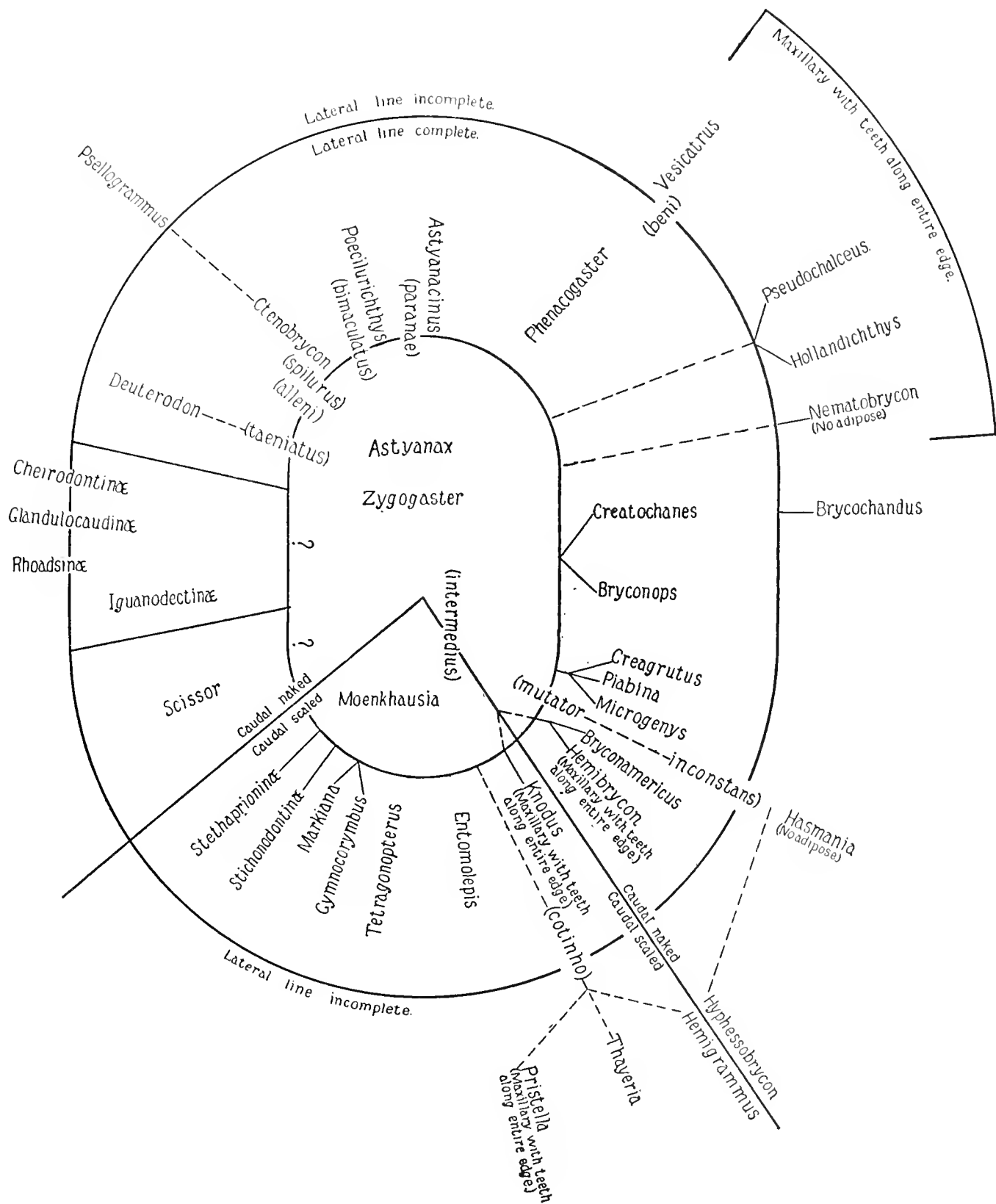


Figure 1.

*Key to the Genera.*

- a. Upper lip covering the teeth of the premaxillary; dentary with a single series of teeth.
- b. Some or all of the teeth serrate or notched.
- c. Gill-rakers setiform or branched.
- d. Preventral area with a median series of scales or with normal scales irregularly arranged, or more or less trenchant with the scales of the two sides bent over the middle.
- e. Maxillary border a simple more or less pronounced curve, or with a break in the symmetry of the curve at the end of the tooth bearing portion.
- f. Caudal fin at least partly covered with small, normal scales.
- g. Lateral line complete (see also under *Hemigrammus inconstans*, *Moenkhausia cotinho*).
- h. Predorsal area with a median series of scales which are not notably smaller than the other scales; D. 10-11.
- i. Anal with a basal sheath of scales, its margin straight or emarginate.
- j. Lateral line much decurved in front, frequently several odd scales in front between it and the next regular series; depth at least half the length; preventral area flat with sharply bent scales on the sides; profile depressed over the eyes; occipital crest  $\frac{1}{3}$  of the distance from its base to the dorsal; outer series of premaxillary teeth complete; anal long. 1. *Tetragonopterus* Cuvier.
- jj. Lateral line little decurved, parallel with the row of scales below it.
- k. Scales crenulate; an enlarged scale on each side of the base of the occipital crest.....2. *Entomolepis* Eigenmann.
- kk. Scales entire; no enlarged scale on sides of the occipital crest.
- (l. Preventral area trenchant.....*Stichonodontinae*).
- ll. Preventral area rounded.
- (m. A procumbent predorsal spine.....*Stethaprioninae*).
- mm. No procumbent predorsal spine.
- n. Second suborbital leaving a naked area between it and the lower limb of the preopercle; at least five teeth in the inner row of the premaxillary; outer series of premaxillary teeth in a line parallel with the inner series except that one tooth frequently retreats from the line of the others.....3. *Moenkhausia* Eigenmann.
- nn. Second suborbital in contact with the suboperculum below; four teeth in the inner row of the premaxillary. Similar to *Bryconamericus*.....4. *Knodus* Eigenmann.
- ii. Anal scaled to near its tip; caudal unequally lobed; anal margin convex.
- 5. *Markiana* Eigenmann.
- hh. Predorsal line largely naked, a few scales of the sides near the dorsal with their margins bent over the back; D. 11 or 12; ventrals in front of the dorsal; anal emarginate or rounded .....6. *Gymnacorymbus*<sup>1</sup> Eigenmann.
- gg. Lateral line incomplete.
- o. Lower caudal lobe much the longer; maxillary without teeth.
- 7. *Thayeria* Eigenmann.
- oo. Caudal lobes equal or subequal.
- p. Maxillary with teeth along its entire length.
- 8. *Pristella* Eigenmann.
- pp. Maxillary teeth, if present, crowded on the upper anterior angle.
- 9. *Hemigrammus* Gill.
- ff. Caudal fin naked except at its base.

<sup>1</sup> *Poptella* (*Stethaprioninae*) is almost identical with this genus but contains a hidden predorsal spine.



- q. Premaxillary teeth in two series.
- r. Second suborbital not in contact with the preopercle below,  
or with 5 teeth in the inner series of the premaxillary.
- s. Lateral line incomplete. See Psellogrammus.
- t. Few teeth if any near the upper angle of the premaxillary.
  - u. An adipose fin.....10. *Hyphessobrycon* Durbin.
  - uu. No adipose fin.....11. *Hascmania* Ellis.
- tt. Maxillary with teeth along its entire edge.
  - v. Anterior teeth of the lower jaw all alike, tricuspid;  
anterior pair of premaxillary teeth little larger  
than the rest...12. *Hollandichthys* Eigenmann.
  - vv. Lateral teeth of lower jaw enlarged, the fourth  
usually largest; middle teeth of premaxillary  
much enlarged.....13. *Pseudochalceus* Kner.
  - (vvv. Anterior teeth of the lower jaw all alike, multi-  
cuspid; caudal scaled...8. *Pristella* Eigenmann).
- ss. Lateral line complete.
  - w. Teeth of the sides of the lower jaw more or less  
abruptly minute.
  - x. Maxillary-premaxillary border angulated  
where they meet.
  - y. Scales cycloid.
    - 14. *Astyanax* Baird & Girard.
  - (z. Predorsal line scaled.....*Astyanax*.
  - zz. Predorsal line at least partly naked.  
*Pocilurichthys* Gill).
  - yy. Scales etenoid at least on breast; anal long,  
39-47, predorsal line scaled.
    - A. Lateral line complete.  
15. *Ctenobrycon* Eigenmann.
    - AA. Lateral line stuttering.  
16. *Psellogrammus* Eigenmann.
  - xx. Maxillary-premaxillary border a continuous  
curve, half as long as the head.  
17. *Astyanacinus* Eigenmann.
- ww. Teeth of the lower jaw all alike in character  
and regularly graduate from in front to the  
last tooth on the sides; two teeth in the  
front row of the premaxillary on each side;  
teeth of the second row multicuspid incisors  
with a contracted base, their anterior and  
posterior surfaces alike, convex, without dis-  
tinct ridges...18. *Deuterodon* Eigenmann.
- www. Teeth of the lower jaw similar, the lateral ones  
much wider than the anterior ones; maxil-  
lary with two very broad incisors whose  
combined width is about half the length of  
the maxillary...19. *Landonia* Eigenmann.
- rr. Second suborbital in contact with the lower limb of the pre-  
opercle; four teeth in the inner series of the premaxillary.

- B.* No adipose fin; lateral line incomplete; outer and middle caudal rays of the male filiform.
20. *Nematobrycon* Eigenmann.
- BB.* Adipose fin present.
- C.* Anal very short, with but ten rays.
21. *Microgenys* Eigenmann.
- CC.* Anal moderate or long.
- D.* Outer row or premaxillary teeth the dominant one. Gill-rakers branched.
22. *Ceratobranchia* Eigenmann.
- DD.* Inner row of premaxillary teeth at least as well developed as the outer. Gill-rakers simple.
- E.* Few teeth along the upper portion of the maxillary.
23. *Bryconamericus* Eigenmann.
- (F.)* Males with a pouch covered with scales at the base of the caudal.
- Argopleura* Eigenmann.
- FF.* Males without a pouch on the caudal.
- Bryconamericus.*)
- EE.* Teeth along the greater part or along the entire edge of the maxillary.
24. *Hemibrycon* Günther.
- gg.* Premaxillary teeth in three series.
- G.* Anal short of not more than 14 rays.
25. *Cecagrutus* Günther.
- GG.* Anal of 20 or more rays.
26. *Piabina* Reinhardt.
- ee.* Maxillary border meeting premaxillary border at a right angle, its upper anterior margin then describing a quarter circle and continued in a direction nearly parallel with that of the premaxillary border; maxillary slender, partially slipping under the preorbital and first suborbital for nearly its entire length. Plate 2, fig. 5.
- II.* Lateral line incomplete.
27. *Brycochandus* Eigenmann.
- III.* Lateral line complete.
- I.* Premaxillary teeth five-pointed, in an outer row of 6-10 teeth; anterior mandibular teeth stronger than those of the premaxillary, 10-12 in number; sides of

the lower jaw with a  
long row of very small  
single-pointed teeth.

28. *Creatochanes* Günther.

II. Premaxillary teeth in  
three series.

29. *Bryconops* Kner.

(dd. Preventral area compressed, the scales of the two sides separated by a series of narrow median scales, the marginal scales of the two sides with their lower margins straight; outer ventral rays filiform..... *Zyggogaster* Eigenmann<sup>1</sup>).

ddd. Preventral area with two series of large overlapping scales; origin of anal in advance of the origin of the dorsal or but little behind it; premaxillary with an inner series composed of several tricuspid and several conical teeth; the outer series of the premaxillary of two or three tricuspid and usually one or more conical teeth.

J. Lateral line complete; caudal naked.

30. *Phenocogaster* Eigenmann.

JJ. Incomplete lateral line.

31. *Vesicatrux* Eigenmann.

bb. Teeth all conical; mouth very large, the lower jaw entering the profile.

32. *Genycharax* Eigenmann.

cc. Gill-rakers short, lanceolate; anal long (29); lateral line complete; maxillary with conical teeth along half of its length; premaxillary and mandibular teeth as in *Tetragonopterus*.

33. *Scissor* Günther.

aa. Upper lip not covering the premaxillary teeth.

K. Premaxillary  
teeth in a main  
outer series  
and a minor  
inner series of  
two or more  
teeth; a pair  
of conical  
teeth behind  
the main series  
of the man-  
dibular teeth  
in front.

34. *Henochilus* Garman.

KK. Premaxillary  
with one series  
of teeth; no  
conical teeth  
in the lower  
jaw.

35. *Psalidodon* Eigenmann.

<sup>1</sup> This has been made a subgenus of *Astyanax*.

## 1. TETRAGONOPTERUS Cuvier.

*τετρας* four, *γωνία* angle, *πτερον*, *το*, wing = square winged.

*Tetragonopterus* ARTEDI, Seba, Locupl. rerum, 1758, **3**, pl. 34, fig. 3, (*argenteus*).

*Tetragonopterus* CUVIER, Règne animal, 1817, **2**, p. 166, (*argenteus*). EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438.

TYPE.—*Tetragonopterus argenteus* Cuvier.

Small fishes, pug-nosed, much compressed and very deep, the depth at least half the length; humped at the occiput, concave over the eyes; interorbital broad, rounded; snout very short, the maxillary nearly vertical; nostrils separated by a valve; a long frontal fontanel extending beyond middle of eye; parietal fontanel continued as a groove to the tip of the occipital crest, which reaches  $\frac{1}{3}$  to the dorsal; cheek largely covered by the suborbital; opercle very short (nearly four times as high as long, in the type); premaxillary teeth in two rows, the teeth of the outer series small, of nearly uniform size, the row more or less regular, the teeth of the inner series larger, graduated, multicuspid, the cusps of each tooth arranged in a curve, the middle cusp much the longest; several large, graduated, several pointed teeth in the front of the lower jaw, abruptly minute teeth on the sides; maxillary with or without teeth on its upper anterior edge; gill-membranes entirely free from the isthmus; gill-rakers long, slender; fins all well developed, the anal long, 32-37; scales entire, large on the middle of the sides, becoming smaller in all directions, notably toward front of anal<sup>1</sup>; lateral line complete, much decurved, several scales between its origin and that of the regular series below it, caudal scaled; preventral area flat, bounded by sharp angles, a median series of scales on the breast; seven or more series of scales between the lateral line and the dorsal; postventral surface trenchant; tongue thick, but little free.

Vertebrae 10 + 19; alimentary canal about 1.4 the length over all.

This genus, most nearly allied to *Moenkhausia*, is readily distinguished from it by the greatly decurved lateral line which is not parallel with the row of scales below it in front.

HABITAT.—Orinoco and Guianas, Amazons and south to Rio de Janeiro and La Plata.

<sup>1</sup> In a specimen of *T. argenteus* the exposed edge of the 9th scale of the lateral line is about twice as high as the exposed edge of the 4th, equal to two scales just below the beginning of the dorsal, greater than the width of the flat ventral surface, equal to the scales of the lateral line *plus* the series above and below it on the caudal peduncle, or equal to  $\frac{3}{4}$  the depth of the caudal peduncle.

*Key to the Species.*

- a.* A. 36 or 37; depth 1.6–1.8 rarely 2; eye in adult less than interorbital; scales toward occiput decreasing in size; occipital process bordered by 5–7 scales on each side; caudal lobes scaled for about half their length; distance of dorsal from tip of snout greater than the distance of the ventrals from tip of snout; ventrals equidistant from tip of snout and last third or last fourth of anal; pectorals reaching beyond origin of ventrals; 12 to 16 azygous, predorsal scales.  
1. *argenteus* Cuvier.
- aa.* A. 32 or 33; depth 1.66–2; eye in adult at least equal to the interorbital; occipital process bordered by 3 or 4 scales on each side; caudal lobes densely scaled to near their tip; dorsal and ventrals about equidistant from tip of snout; ventrals equidistant from tip of snout and end of anal; pectorals usually not reaching origin of ventrals; 8 or 9 azygous predorsal scales. Scales 7–29 to 31–3.5; a caudal spot.....2. *chaleucus* Agassiz.
- aaa.* A. 32; depth 1.66; eye 2.7 in the head, a little less than the interorbital, which is 2.33 in the head; pectorals reaching a little beyond origin of the ventrals; scales 8.5–31–4.5; caudal scaled to its tip.....3. *huberi* Steindachner.
- aaaa.* A. 31–33; depth 1.66–1.8; eye 2.2–2.4 in the head, greater than interorbital; ventrals nearer the snout than the dorsal, equidistant from snout and last fourth of the anal; pectorals reaching past origin of ventrals; scales 7–28 to 29–3.5 to 4.....4. *gibbasus* Steindachner.

## 1. TETRAGONOPTERUS ARGENTUS Cuvier.

Plate 2, fig. 1; Plate 4, fig. 2.

*Tetragonopterus argenteus* CUVIER, Mem. Mus. hist. nat., 1848, 4, p. 455 (Bahia?); MÜLLER & TROSCHEL, Horae ichthyol., 1845, 1, p. 13 (Brazil & Guiana); Fische British Guiana, 1848, p. 634 (Amucu); CUVIER & VALENCIENNES Hist. nat. poissons, 1848, 22, p. 132 (Bahia?); KNER, Characinen, 1859, p. 38 (Cujaba; Guiana); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 318; STEINDACHNER, Ichthyol. beitr., 1876, 5, p. 46 (Santarem); Flussf. Südamer., 1879, 1, p. 7 (Orinoco, near Ciudad Bolívar); 1882, 4, p. 13 (Amazons, Iquitos); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 273; BOULENGER, Trans. Zool. soc. London, 1896, 14, p. 35 (Descalvados, Northern Paraguay); PELLEGRIN, Bull. Mus. hist. nat., 1899, 5, p. 157 (Apurc; Manaos); BOULENGER, Boll. Mus. univ. Torino, 1900, 15, no. 370, p. 2 (Urucum); EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 126, fig. 10 (Puerto Murtinho; Bahia Negra); Rept. Princeton univ. exped. Patagonia, 1900, 3, p. 439; Mem. Carnegie mus., 1912, 5, p. 319, fig. 37 (Tumatumari); FOWLER, Proc. Acad. nat. sci., Phil., 1914, p. 242 (Rupununi).<sup>1</sup>

*Tetragonopterus rufipes* VALENCIENNES, d'Orbigny, Voy. Amer. Merid. Poissons, 1847, pl. 11, fig. 1 (Buenos Aires); CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, 22, p. 136 (Buenos Aires); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 318 (Buenos Aires); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2, 10, p. 42 (Candelaria, Río Paraná; Río Paraguay at Asuncion); LAHILLE, Rev. Mus. de la Plata, 1895, 6, p. 7 (Punta Lara, Isla Santiago); ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 272.<sup>2</sup>

<sup>1</sup> *Tetragonopterus argenteus* about 100 mm. Cuvier's type (said to contain thirty-four anal rays by Cuvier and forty by Valenciennes) has thirty-seven and a half anal rays; dorsal broken. Lateral line 30; a dark vertical bar at origin of caudal; two vertical bars behind the head.

<sup>2</sup> The types, three specimens, of *T. rufipes* in the Jardin des Plantes from Buenos Aires are in bad condition; they are 100, 110, and 118 mm. long. These are evidently the ones figured and described by Valenciennes who wrote the label. They have A. 37; interorbital slightly convex. It is impossible in their state of disintegration to distinguish them from *T. argenteus*, with which they are very probably identical. I have not seen the type of *T. sawa*.

*Tetragonopterus sawa* CASTELNAU, Exped. Amer. Sud. Poissons, 1855, p. 65, pl. 33, fig. 1 (Rio Coxas).  
*Tetragonopterus chalcus* EIGENMANN & KENNEDY (non Agassiz), Proc. Acad. nat. sci. Phil., 1903, p. 523  
 (Rio Paraguay; Arroyo Trementina).

HABITAT.—From the Orinoco and Guiana to the Paranahyba basin, Amazonas and Paraguay, Parana to Buenos Aires. Not in the coastwise streams between Buenos Aires and the Paranahyba. It is rare in Guiana and the only species in the La Plata basin.

*Specimens examined.*<sup>1</sup>

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
18982 <sup>2</sup>	3	80-125	Tabatinga	Bourget
20793	15	55-125	Hyavary	Bourget
20794				
20797				
20799				
820	1	119	Fonte Boa	Fletcher
20748	1	118	Fonte Boa	Agassiz
20819	7	70-130	Iça	James
20745	14	65-115	Tocantins	Agassiz
20859	3	100-110	Jutahy	{ James, Thayer, Talisman.
20822	2	100-115	San Paolo	James
20726	4	87-104		Agassiz
20728	6	69- 85	Lake Hyanuary	Agassiz
20976	6	75-about 130	Lago Alexo	Thayer
29982				
20741	5	68- 84	Tajapurú	Agassiz
20718	4	71- 78	Villa Bella	Agassiz
20847	1	60	Obidos	Bentos
20776	13	49- 85	Santarem	Bourget.
20777				
20786				
20791				
27729	9	63- 85	Monte Alégre	Agassiz
?				
20953	1	83	Jatuarana	Navez
2978 C.	2	69- 72	San Joaquín, Guaporé basin	Haseman.
2976 C.	4	67- 86	Santarem	Haseman.
21007	1	about 90	José Fernandez	Coutinho.
21052	6	64-108	Rio Puty, into Rio Paranahyba	St. John.
21053				

<sup>1</sup> I have also examined the types of *T. argenteus* and *T. rufipes*.

<sup>2</sup> Numbers without designation indicate the Museum of Comparative Zoölogy; C. = Carnegie Museum, Pittsburgh; I. = Indiana University; U. = U. S. National Museum.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
21051	75 <sup>1</sup>	66-107	Rio Puty	St. John.
21056	12	bad	San Gonçallo, Rio Paranahyba	St. John.
10022 I.	1	about 90	Arroyo Trementina, Paraguay	Anisits.
10023 I.	2	about 56-about 85	Asuncion, Paraguay	Anisits.
10253 I.	3	about 82-about 95	Bahia Negra, Paraguay	Anisits.
10255 I.	8 <sup>2</sup>	about 64-100	Puerto Murtinho, Paraguay	Anisits.
1489 C.	1	67	Tumatumari, Brit. Guiana	Eigenmann.
3317 C.	3	24-104	Asuncion, Paraguay	Haseman.
3318 C.	1	33	Sapucay, Paraguay	Haseman.
3319 C.	35	38- 96	Villa Hays, Paraguay	Haseman.
2977 C.	3	28- 80	Corumba, Rio Paraguay	Haseman.
2979 C.	1	55 to base of caudal	Rio Jauru, into Rio Paraguay	Haseman.
2980 C.	4	58- 67	Caceres, Rio Paraguay	Haseman.

This species can always be readily distinguished by its great depth and the two vertical humeral bars. The latter, though in some cases shadowy, are evident in all of the specimens examined.

Head 3-3.66; depth 1.6-1.8, rarely 2; D.11; A. usually 36 or 37<sup>3</sup>; scales 7 to 9-32 to 35-3½-5.<sup>4</sup> Eye 2.25 in the young, 3 in the adult; interorbital less than the eye in the young, greater than the eye in the adult.

Deep, compressed, ventral profile evenly rounded from the tip of the lower jaw to the origin of the anal; anal basis nearly straight, very steep. Dorsal profile depressed over the eyes, humped to the dorsal; dorsal basis straight, oblique; postdorsal to caudal nearly straight, oblique. Preventral area with a median series of flat or slightly keeled scales, bordered on the sides by series of angularly bent scales; postventral area with a median series of small, narrow

<sup>1</sup> Of these, twenty-five ♂, judging by the anal armature, range from 66-90 mm., only three reaching the latter size; the smallest female is 80 mm. long, while thirty-six of them exceed the length of the largest male. Of twelve taken at random six have thirty-six anal rays, four have thirty-seven, two have thirty-eight.

<sup>2</sup> Of these, three have thirty-five anal rays, two have thirty-six, one has thirty-eight, and two have thirty-nine; three have eight scales between the dorsal and lateral line, four have nine; all but one have four and one half scales between the lateral line and the ventrals, one has five. The scales in the lateral line are thirty-two in two, thirty-three in two, thirty-four in two, and thirty-five in two.

<sup>3</sup> Counting all rudimentary rays at the beginning and the double one at the end as one, out of fifty-six specimens taken at random, four have thirty-four, nine thirty-five, eighteen thirty-six, fourteen thirty-seven, seven thirty-eight, and four thirty-nine.

<sup>4</sup> In Amazonian specimens fifteen out of eighteen had seven scales between the origin of the dorsal and the lateral line, the other three had eight. Out of twenty-four Amazonian specimens one has thirty-one, one thirty-two, twelve have thirty-three, nine thirty-four, one has thirty-five. Thirteen out of eighteen have three and one half scales between the ventrals and the lateral line, five have four. In the specimens from Puerto Murtinho there is a larger number of scales above and below the lateral line. Three out of seven have eight, the other four have nine scales between the dorsal and lateral line; six out of seven have four scales between the lateral line and the anal and one has five. The scales in the lateral line do not differ.

bent scales, bordered on the sides with small asymmetrical scales, the area compressed; predorsal region keeled; predorsal scales small, crowded, the median series of scales (12-16) reaching to occipital process.

Occipital process long, one third of the distance from its base to the dorsal, bordered by from five to seven scales on each side, the groove of the occipital fontanel reaching to its tip; interorbital convex; second suborbital not covering the entire cheek; maxillary equal to the distance from tip of snout to pupil. From five to seven (rarely four to eight) teeth forming a continuous front series of the premaxillary, the third (in one case the fourth) usually withdrawn somewhat from a straight line. Five (rarely four or six) teeth in the inner row; maxillary with three (rarely one, two, or four) small teeth. Lower jaw with four, or very rarely five, large teeth; the second largest, graduated to the fourth or fifth; many small teeth on the side.<sup>1</sup> Gill-rakers about 9 + 13, the longest one third the diameter of the eye.

Scales deeply imbricate, an occasional line on the scales of the sides, lines more numerous on those near the caudal; scales of the sides continuous with the anal sheath consisting of three or four rows of scales in front and tapering to a single series on the last ray. Lateral line obliquely descending on the first seven scales, then nearly straight; a well-developed axillary scale; caudal lobes scaled for about half their length. Origin of dorsal about equidistant from tip of snout and base of middle caudal rays, its first divided ray two and one half times as long as the last, three times in the length.<sup>2</sup> Anal in the adult low, its margin nearly straight; in the young the anterior rays are higher than the rest. Origin of ventrals much nearer tip of snout than the dorsal, equidistant from

<sup>1</sup> An examination of a variety of specimens gives the number of teeth in the:

	mandible 4 5	first series of pre- maxillary 4 5 6 7 8	second series of premaxillary 4 5 6	maxillary 1 2 3 4	Localities
males	10	1 5 4	10	7 2	Rio Puty
females	7 3	7 3	10	1 1 5 3	Rio Puty
	6	2 4	6	5 1	Iça
	13	1 3 6 3	1 10 2	3 10	Santarem
	6	1 3 2	4 2	2 4	

In this table the first line of figures gives the different numbers of teeth found on the structures mentioned above and the following lines represent the number of individuals having the given number.

<sup>2</sup> In the specimen from Tumatumari the first divided ray is three and one half times as high as the last ray which is two thirds the length.



tip of snout and last fourth of anal. Ventrals reaching to anus or anal; pectorals beyond the origin of the ventrals.

Two oblique dark bars, one from in front of the dorsal to the pectoral, the other parallel to it from behind the tip of the occipital crest; a dusky predorsal line continued on the first dorsal ray; a dark spot at end of caudal peduncle, inconspicuous in the adult, sometimes extending across the entire peduncle and base of caudal in the young. Anal sometimes margined with dusky. Dorsal membrane thickly punctate. Otherwise bright silvery.

About twelve of the anterior anal rays of the male with hooklets turned toward the base of the fin, about twelve of the hooklets on the middle half of the first rays, the number decreasing backward.

Air-bladder very large, each section a cone, their bases contiguous, the posterior section nearly twice as long as the anterior, bent downward and extending to the origin of the anal, the diameter of its large end equaling two thirds the length of the head. Alimentary canal about one and two fifths times the length over all.

Vertebrae 10 + 19 counting the coalesced as one. Tip of occipital process extending much beyond the posterior face of the skull.

## 2. *TETRAGONOPTERUS CHALCEUS* Agassiz.

Plate 4, fig. 1; Plate 98, fig. 4.

*Coregonus amboinensis* ARTEDI, Species, 1738, p. 44.

*Tetragonopterus argenteus* ARTEDI, Seba, Leeupl. rerum, 1758, 3, tab. 34, fig. 3, p. 174 (Rio Negro; Surinam).

*Tetragonopterus chalceus* AGASSIZ, Spix Selecta gen. et spec. Pisc. Bras., 1829, p. 70, tab. 33, fig. 1 (Brazil); CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, 22, p. 140; KNER, Characinen, 1859, p. 38 (Rio Negro; Surinam); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 329 (British Guiana, Essequibo); COPE, Proc. Acad. nat. sci. Phil., 1871, p. 260 (Ambyiacu); STEINDACHNER, Ichthyol. beitr., 1876, 5, p. 47 (Xingu, near Porto do Moz); EIGENMANN & EIGENMANN, Proc. N. S. N. M., 1891, 14, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 227; VAILLANT, Bull. Mus. hist. nat., 1899, 5, p. 154 (Carsevenue); PELLEGRIN, Bull. Mus. hist. nat., 1899, 5, p. 157 (Apuré); FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 440 (Ambyiacu; Marañon; Pebas); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438; Mem. Carnegie mus., 1912, 5, p. 320, fig. 38 (Wisnar; Bartica; Tumatumari; Crab Falls; Rockstone); FOWLER, Proc. Acad. nat. sci. Phil., 1914, p. 242 (Rupununi).

? *Tetragonopterus artedii* CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, 22, p. 128 (Surinam); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 319; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 272.<sup>1</sup>

<sup>1</sup>The type of this species was given to the Paris museum by the Leyden museum. It measures 68 mm. to base of caudal. Lat. line 31; A. 32 (Valenciennes says 40).

*Tetragonopterus schomburgkii* CUVIER & VAL., Hist. nat. poissons, 1848, **22**, p. 137 (Essequibo)<sup>1</sup>.

*Tetragonopterus ortonii* GILL, Proc. Acad. nat. sci. Phil., 1870, p. 92 (Brazil ?); COPE, Proc. Amer. philos. soc., 1869, **11**, p. 566 (Pebas).

*Habitat*.—Guianas and Amazons, Rio San Francisco.

*Specimens examined*.<sup>2</sup>

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20747	8	76-118	Maues, Rio Madeira	Agassiz.
20994	1	88	Serpa	Thayer.
20714	1	65	Villa Bella	Agassiz.
20828	1	about 68	Obidos	James.
20781	8	81-92	Santarem	Bourget.
21009	1	135	?	Justa.
20923	2	62-88	San Francisco below the falls	Hartt.
20852	2	about 68	Jutahy	James, Thayer, and Talisman.
20746	7		Porto do Moz	Agassiz.
1377 C. 11852 I.	4	58-68	Wismar, Demerara River	Eigenmann.
1378 C. 11853 I.	6	65-71	Bartica, Essquibo River	Shideler.
1379 C. 11854 I.	15	47-76	Tumatumari, Potaro River	Eigenmann.
1380 C. 11855 I.	18	50-91	Crab Falls, Essequibo River	Eigenmann.
1381 C. 11856 I.	48	41-49	Rockstone, Essequibo River	Eigenmann.
2989 C.	2	65-80	Maciel, Rio Guaporé	Haseman.
2990 C.	21	largest 61	Santa Rita, San Francisco Basin	Haseman.
2991 C.	13	60-76	Joazeiro, Rio San Francisco	Haseman.
2992 C.	3	54-80	Penedo, Rio San Francisco	Haseman.
2993 C.	3	52-63	Penedo, Rio San Francisco	Haseman.
		(to base of caudal)		
2994 C.	6	48-81	Pirapora, San Francisco	Haseman.
2995 C.	5	35-75	Barreiras, Lagoas of Rio Grande, Rio San Francisco	Haseman.
2996 C.	19	largest 42	Boqueirão, near mouth of Rio Preto	Haseman.
2997 C.	31	71	Lagoa Pereira, Rio San Francisco	Haseman.

Head 3.2-3.66; depth  $1\frac{5}{6}$ -2; D. 11; A. usually 32 or 33.<sup>3</sup> Scales 7-29 to

<sup>1</sup> The type, one specimen in bad condition, from the Essequibo, 160 mm. A. 32; scales large, about 30; depth a little less than 2; head 3.66; eye very large, about 2.33 in the head, about equal to the convex interorbital; maxillary with three small teeth; pectorals extending to ventrals; anal not falcate, dorsal behind the vertical from the ventrals, not reaching the adipose. No occipital process. The nape of the specimen seems to have met with an accident and it is difficult to determine how much of the difference between it and the types of *T. rufipes* is due to bad preservation and to the mutilation. The eye is much larger than in the type of *T. rufipes*. Caudal spot not continued on the middle rays.

<sup>2</sup> I have also examined the types of *T. artedii* and *T. schomburgkii*.

<sup>3</sup> Out of twenty-one one has twenty-eight, one has thirty, four have thirty-one, eight have thirty-two, five have thirty-three, and two have thirty-four anal rays.

34<sup>1</sup>-35<sup>1</sup>. Eye 2.2-2.3; interorbital 2.2-2.66, equal to the eye or less than the eye in the adult.

Deep, compressed, ventral profile evenly curved to the anal, not as greatly arched as in *T. argenteus*; anal basis nearly straight. Dorsal profile depressed over eye; arched to the dorsal; dorsal basis oblique, straight; postdorsal part of profile nearly straight. Preventral area with a median series of flat or slightly keeled scales, bordered on the side by a series of angularly bent scales; postventral area with a series of small, narrow bent scales, the area compressed; predorsal region bluntly keeled, the scales not notably small, the median series of eight or nine scales reaching the occipital process.

Occipital process long, one third of the distance from its base to the dorsal, bordered by three or four scales on each side; groove of the occipital fontanel reaching to its tip; interorbital convex; second suborbital not covering the entire cheek; maxillary equal to the distance from tip of snout to pupil; five or six teeth in the front series of the premaxillary (five in thirteen cases, six in fourteen), the third tooth from the middle usually withdrawn from the line; five teeth in the inner series of the premaxillary; usually three teeth (two in five cases, three in eighteen, four in four) on the maxillary; lower jaw with four large graduated teeth and many small ones on the side.

Gill-rakers about 4 + 13, the longest about one third the diameter of the eye.

Scales deeply imbricate, striae lacking or an occasional line on the scales, the striae fairly numerous near the caudal; scales of the sides continuous with the anal sheath which is composed of three series of scales near its anterior end, becoming reduced to a single series on the last rays; caudal lobes densely scaled to near their tips in the adult, the scales much more readily caducous than those of the sides; lateral line obliquely descending on the first seven scales then nearly straight. A well-developed axillary scale.

Origin of dorsal equidistant from tip of snout and tip of adipose or caudal, its highest ray three to four times as high as its lowest, two to three in the length; anal in the adult with its margin nearly straight; the anterior rays being but slightly prolonged; origin of ventrals equidistant from the tip of snout with the dorsal and equidistant between the tip of snout and end of anal, reaching to anus; pectorals usually falling short of the ventral, except in Guiana specimens.

<sup>1</sup> Of ten specimens from Lagoa Pereira one has twenty-nine, three have thirty, four thirty-one, and two thirty-two. Of ten specimens from Rockstone one has thirty-one, three have thirty-two, five thirty-three and one has thirty-four.

Fresh specimens from the Essequibo River have the fins more or less suffused with red. The first prolonged anal ray milk-white, the first fully formed dorsal ray either dark or milk-white. In these specimens there is a humeral spot prolonged above and below with a bar and a second bar fainter but evident extends down from the dorsal parallel with the first. There is a well-marked dark band-like spot at the base of the caudal. These approach *T. argenteus* in color. The first three developed rays of the dorsal sometimes reach the caudal, the first three anal rays are also sometimes prolonged to a length about two thirds that of the anal base.

No humeral bars in old alcoholic specimens in which the caudal spot is more or less obscure with age; dorsal membranes thickly peppered; general color bright and iridescent, silvery.

Air-bladder very large, the sections conical, the posterior about twice as long as the anterior, sharply pointed behind, its largest diameter, at its base, equals about half the length of the head.

Alimentary canal somewhat longer than the entire fish.

Vertebrae 10 + 19; occipital process extending much beyond the posterior face of the skull.

### 3. TETRAGONOPTERUS HUBERI Steindachner.

*Tetragonopterus huberi* STEINDACHNER, Anz. K. akad. wiss. Wien, 1909, no. 12, p. 172 (Rio Purus); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438.

HABITAT.—Rio Purus, Upper Amazon Basin.

This species known only from the brief description of two specimens is said to differ from *T. argenteus* chiefly in having its caudal completely scaled. It is evidently closely allied if not identical with *T. chalcus*.

Head 2.7; depth 1.66; D. 11; A. 32; scales 8.5–31–4.5. Eye 2.7 in the head; interorbital 2.33.

Belly with lateral keels; profile of head concave, that of nape very convex; maxillary with 3–4 teeth; height of prolonged dorsal rays 3 in the length; pectorals little shorter than head, reaching beyond origin of ventrals; ventrals  $1\frac{1}{10}$  in the head; origin of ventrals in front of the vertical from the dorsal; predorsal area keeled; distance between dorsal and adipose equal to the head.

A row of scales along the base of the anal; traces of two dark vertical humeral bands; caudal spot wanting in a small specimen, faint in a large one.

## 4. TETRAGONOPTERUS GIBBOSUS Steindachner.

*Tetragonopterus gibbosus* STEINDACHNER Süßwf. südöstl. Bras., 1876, **3**, p. 4, pl. 1, fig. 1 (Rio Parahyba); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 277; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438.

HABITAT.—Parahyba.

This species is known only from the types in the Vienna Museum. If the caudal is naked as the artist has drawn it and if as Dr. Steindachner says the “Oberkiefer, unter der Loupe gesehen, am vorderen Rande dicht mit Zähnen besetzt....” then this species does not belong to *Tetragonopterus* as here understood. In the characters other than the above and those mentioned in the key this species closely resembles the *Tetragonopterus chalcus* which geographically is its closest neighbor.

Head 3.6; depth 1.66–1.8; D. 10–11; A. 31–33; scales 6.5 or 7–28 or 29–3.5 to 4. Eye 2.2–2.4 in the head; interorbital 3 in the head.

Much compressed, the profile little concave over eye, rising rapidly; ventral profile regular to the anal; depth of caudal peduncle 5 in the greatest depth; mouth oblique, terminal; 10–11 mandibular teeth, with the exception of the outer pair more than twice as long and thick as the premaxillary teeth; second suborbital nearly covering the cheek; origin of the dorsal a little in advance of the middle; pectorals reaching a little beyond origin of the ventrals, equal to the length of the head in the male, considerably shorter in the female, ventral considerably in advance of the vertical from the dorsal, not reaching anal; basis of anal scaled; its base half an orbital diameter longer than the head.

Caudal only moderately forked and about as long as the head. Lateral line rapidly descending on the first six scales; scales of the middle of the sides very deep, radiae variable, 1–7; the three preventral series of scales very bluntly keeled; the lateral keels forming the edge of the belly. Scales of the nape apparently not decreasing in size.

A light yellow lateral band; humeral and caudal spots very faint, the former sometimes absent.

## 2. ENTOMOLEPIS, gen. nov.

έντομος, cut; λεπὶς, ῆ, scale. In allusion to the crenate scales.

TYPE.—*Tetragonopterus steindachneri* Eigenmann.

Caudal scaled; lateral line but little decurved, complete; the scales crenate; an enlarged scale on either side of the occipital process; maxillary with few

teeth, second suborbital leaving a narrow naked area on the cheek. This genus differs from *Moenkhausia* in having crenate instead of entire scales.

HABITAT.—Middle and Upper Amazon.

1. *ENTOMOLEPIS STEINDACHNERI* (Eigenmann).

Plate 3, fig. 1–3, Plate 5, fig. 3.

*Tetragonopterus lineatus* STEINDACHNER (non Perugia), Ichthyol. beitr. 1891, **15**, p. 26, pl. 2, fig. 1 (Iquitos).

*Tetragonopterus steindachneri* EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 53.

*Moenkhausia steindachneri* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437

?*Astyanax oligolepis* FOWLER (non Günther), Proc. Acad. nat. sci. Phil., 1906, p. 439, fig. 37 (Peruvian Amazon).

HABITAT.—Middle and Upper Amazon.

Aside from the types in Vienna I have examined the following, from which the present description is drawn:

Two specimens, 20967, 71 and 74 mm. to base of caudal. Cudajas. Thayer & Bourget.

Head 3.6; depth 2.26; D. 10 or 11; A. 25 to 26; scales 5–32 to 33–4 or 4.5. Eye 3–3.2; interorbital 2.4 in head.

Deep oval, without distinct humps or depressions; preventral area somewhat compressed, keeled; postventral area more narrowly compressed; predorsal area with a blunt median keel; a median series of nine scales reaching from dorsal to occipital process.

Occipital process about one fifth of the distance of its base from the dorsal, bordered by one or two scales, the first of which is unusually large; skull heavy and broad; frontal fontanel nearly circular, not half as long as the occipital fontanel; interorbital convex; second suborbital corrugate, leaving but a very narrow naked border; interopercle distinctly visible from the side; maxillary 3.33 in head; four teeth in the outer series of the premaxillary, the middle two close together, the third withdrawn from the line of the others; five teeth in the inner series; one or two teeth on the maxillary; mandible with four large graduated teeth. Gill-rakers 8 and 10, very slender, the longest two thirds of the pupil.

Scales large, *crenate*, very regularly imbricate, the exposed margin of those on the caudal peduncle three fourths as high as the highest on the middle of the sides; the scale at the base of the occipital crest much larger than usual; each

scale with a few widely diverging striae and numerous shorter ones along the margin; anal sheath composed of two series of scales in front, of a single series behind; caudal lobes sealed for about half their length; lateral line not greatly descending, the rows of scales above and below it parallel with it; a well-developed axillary scale.

Dorsal about equidistant from snout and caudal, short and high, its height 3.66 in the length; anal margin nearly straight, but the anterior rays nearly twice as high as the posterior; pectorals reaching ventrals, the latter not to the anal, equidistant from tip of snout and base of last anal ray.

Brownish above, silvery on the sides; a series of dark lines between the series of scales; a faint humeral spot just above the fourth scale of the lateral line; a large caudal blotch not extending forward or to the end of the middle rays.

This species can easily be distinguished by its crenate scales, compressed breast, and peculiar coloration.

It is very probable that Fowler's *Astyanax oligolepis* is this species. If the rows of scales are as Fowler figures then his specimens are distinct, differing from all other species of the group.

### 3. MOENKHAUSIA Eigenmann.

For William J. Moenkhaus.

*Moenkhausia* EIGENMANN, Smithsonian misc. coll. quart., 1903, 45, p. 145.

TYPE.—*Tetragonopterus xinguensis* Steindachner.

Small fishes differing from *Tetragonopterus* in the course of the lateral line. The line is straight or but little decurved. In other characters some of the species of this genus agrees with *Tetragonopterus*. The species differ greatly in shape. The extreme in one direction are very compressed and very deep, the depth being more than one half the length. The extreme in the other direction are quite slender, subspindle shaped, the depth being only one fourth of the length. The preventral area may be either narrowly rounded, as in *M. profunda*, *latissima*, *comma*, and *oligolepis*, more broadly rounded as in *M. chysargyrea*, or flat with lateral angles as in *M. jamesi*, *megalops*, *et al.* There is a regular median series of scales in front of the ventrals. The anal rays range from 18–37, in number; the scales from 22–39; the lateral line is complete except as noted under *M. australe*, *cotinho*, and *sanetae filomenae*. In these species the

lateral line is complete in the specimens from some localities and incomplete in those from other localities, or both types may be found in the same place. The genus differs from *Astyanax* in having its caudal partly covered with minute scales. It merges directly into the genus *Hemigrammus* which has an incomplete lateral line.

HABITAT.—Very abundant in Guiana and the Amazons, extending south to the Paraguay and Paraná Rivers and to the Rio Doce. It has not been recorded from the Magdalena Basin from Central America, the western slope of South America, or the lower reaches of the La Plata.

### *Key to the Species.*

- a. Depth considerably more than half of the length; much compressed. A. 33; scales 8-34-7.
  - 1. *boulfi* Fowler.
- aa. Depth 2-2.66 in the length, sometimes 3.25 in *M. costae*. See also *aaa*. A. 23-36; Occipital process one third to one fifth as long as the distance from its base to the dorsal.
- b. Five or more scales between the lateral line and ventrals.
  - c. Horizontal dark lines between the rows of scales; no caudal spot; humeral spot very long, pointed in front. Median line behind occipital process sometimes covered by the bent over margins of the scales along the side of the compressed back. Head 3.75; depth 2; A. 31-36; scales 5½ or 6-33 to 36-6; preventral area narrowly rounded; predorsal area sharply keeled; occipital process two sevenths of the length from its base to the dorsal; origin of ventrals equidistant from tip of snout and origin of last third of anal.
    - 2. *latissima* Eigenmann.
  - cc. No horizontal dark lines; seven scales between dorsal and lateral line; ventrals equidistant from tip of snout and last anal ray, or nearer the latter; a median series of scales from the dorsal to the occipital process.
  - d. A caudal spot; a large faint vertically crescentic humeral spot; mouth minute; preventral area flat; head 4; depth 2-2.2.
    - e. A. 33-35; scales 7-35 to 37-5; anal margin nearly straight; maxillary short, its length equals length of snout; premaxillary teeth three- or five-pointed; maxillary without teeth; five graduated teeth on each side of the lower jaw; second suborbital leaving but a narrow naked area; maxillary 4 in head; mandible 3.....3. *jamesi* Eigenmann.
    - ee. A. 31; scales 7-36-6; maxillary with a single tooth; premaxillary teeth four or five pointed; four graduated teeth on each side of the lower jaw; maxillary less than snout in length, 5 in head; mandible 3 in head; second suborbital but two thirds the width of the cheek.....4. *justae* Eigenmann.
  - dd. No caudal spot; a well-defined longitudinally ovate or round humeral spot; preventral area rounded; mouth large; fins large.
    - f. Maxillary with many teeth; eye large, 2-2.5 in the head, the profile much depressed over the eye; interorbital less than diameter of eye; one fourth of the cheek naked; humeral spot elongate, beginning over the second scale of the lateral line; depth 2.1-2.6; head about 4; A. 34-37; scales 7 or 8-34 to 37-6 or 7; highest dorsal ray not reaching adipose.....5. *doccana* (Steindachner).
    - ff. Maxillary with 1 or 2 teeth, equal to the distance from tip of snout to pupil; eye 2.5



or more in the head, equals interorbital; profile not much depressed over eye; humeral spot short, nearly equidistant from opercle and dorsal; depth 2.4-2.4; A. 26-30; scales 7-33 or 35-5 or 6; highest dorsal ray usually not reaching adipose.

6. *chrysargyrea* (Günther).

fff. Maxillary with two teeth; maxillary longer than the distance from tip of snout to pupil; eye 2.5 or more in the head, equals interorbital; the profile scarcely depressed; humeral spot prolonged forward to a point; depth 2+; A. 26; scales 6-32-5; highest dorsal rays reaching the adipose.....7. *comma* Eigenmann.

bb. Three and a half or four scales between the lateral line and ventrals.

g. Six scales between the dorsal and the lateral line. Depth 2.3; no caudal spot, no humeral spot; A. 26, lateral line 31; maxillary length equals distance from tip of snout to pupil; third tooth of the anterior premaxillary series entirely withdrawn from the line of the rest, *forming a separate series*; maxillary with 2 teeth; a black line along base of anal; occipital process one fifth the distance from its base to the dorsal.....8. *mclogramma* Eigenmann.

gg. Five scales between the dorsal and lateral line.

h. A broad black band across the anterior part of caudal. A. 23-28; preventral area narrowly rounded.....(See also *M. cotinho*).

i. Scales 5-29 to 32-4.....9. *obigolepis* (Günther).

ii. Scales 22-26, rarely 28.....10. *sanctae filomenae* (Steindachner).

hh. Caudal without black band.

j. Some striae of the scales diverging from the middle line of each scale in nearly opposite directions, up and down; eye 2.33-2.5 in the head, equal to the interorbital; origin of dorsal directly over the origin of the ventrals; no caudal spot in the adult; a round humeral spot. Anal usually 26-28, emarginate; depth usually 2 (sometimes 2.4) scales 5-24 to 32-1.

11. *grandisquamis* (Müller & Troschel).

jj. Striae of the scales not as under j.

k. Depth 2 in the length; anal not emarginate; dorsal rounded, the anterior rays not much higher than the posterior, its origin behind that of the ventrals. Eye 3 in the head, 1.33 in interorbital; scales 5-31-4 (to ventrals); A. 27, its margin straight; head 3.66; depth 2; profile scarcely depressed; maxillary with two teeth, extending somewhat beyond the anterior margin of the eye; preventral area flat; a large caudal spot, not extending to the end of the middle rays.....12. *oralis* (Günther).

kk. Depth 2.2-2.6 in the length. Upper caudal lobe not black.

l. Eye 2.4 or more in the head.

m. A. 30-33; scales 5.5-37-4.5; head 4.2-4.3; depth 2.1; interorbital smaller than eye; a faint vertical humeral spot; tips of caudal and middle rays faintly dusky.....13. *barbouri* Eigenmann.

mm. A. 26; scales 5-32-4; head 3.33; depth 2.33; maxillary reaching to near middle of eye; no caudal spot; humeral spot large, faint.

14. *xinguensis* (Steindachner).

mmm. A. 23-24; scales 5-30 to 34-3; head 3.75-4; depth 2.3-2.6. Scales with dark margins; a well-developed humeral spot.

15. *browni* Eigenmann.

ll. Eye 2-2.2 in head; interorbital 2.4-3; scales 5-35-4; head 3.6-3.7; depth 2.5-2.66;

<sup>1</sup> Based on type in the British museum.

- n.* No caudal spot; a vertical humeral spot. A. 28-30.  
16. *megalops* Eigenmann.
- nn.* A median caudal spot; no humeral spot. A. 26.  
17. *shideleri* Eigenmann.
- kkk.* Upper caudal lobe with an oblique black band, continued downward across the caudal peduncle and along the basal portion of the anal. A. 27-28, scales 5.5-32 or 33-3.5; head 3.4-3.75; depth 2.25-3.25. Longitudinal extent of premaxillary insignificant.  
18. *costae* (Steindachner).
- aaa.* Depth usually more than 2.75 in the length (2.6 in *M. dichrourea*, *M. lata*, and gravid *M. colletti*), anal less than 28 in all but exceptional specimens of *M. dichrourea* and *M. lata*.
- o.* Base of caudal without definite spot or band.
- p.* Premaxillary very short; maxillary with its anterior margin very convex. Caudal lobes black at the tips, or with a black band across them, their tips white; base of caudal pale; depth usually 3(2.75); A. 25-27 rarely 28; lat. line 36 or 37 (rarely 34, 35, or 39); gill-rakers one third to one half the length of the eye.....19. *dichrourea* (Kner).
- pp.* Anterior margin of maxillary not sharply and evenly curved premaxillary longer than under *p*, the mouth strong.
- q.* Tips of caudal lobes black or a black band across the lobes.
- r.* A. 25; scales 5-35-3.5; depth 3.1-3.75.  
20. *intermedia* Eigenmann.
- qq.* Lobes of caudal without well-defined cross-band.
- s.* Base of anal without a black line.
- t.* Base of upper caudal lobe yellow or orange, this followed by black which fades toward the tip with water markings.
- u.* Depth 3-3.5; A. 24 (21-27).  
21. *lepidura lepidura* (Kner).
- uu.* Depth 2.6; A. 26 (25-28); lateral line 33 or 34, middle caudal rays faintly colored.  
22. *lepidura lata* Eigenmann.
- tt.* Upper caudal lobe not black.
- v.* Depth 3; A. 23 or 24; lateral line 31-33; pectorals not reaching ventrals; upper caudal lobe and sometimes the distal part of the other rays dusky.....23. *lepidura icae* Eigenmann.
- vv.* Depth 3.4; A. 24; lateral line 37; pectorals not reaching ventrals; caudal lobes plain.  
24. *lepidura hasemani* Eigenmann.
- ww.* Depth 4; A. 21-23; lateral line 35-36; pectorals to ventrals; usually the middle caudal rays and distal part of all the other rays dusky.  
25. *lepidura gracilima* Eigenmann.
- ss.* Anal with a dark (zigzag) line along its base; silvery lateral line very narrow, bordered with dark above, no caudal spot; upper part of cheek and opercle with numerous chromatophores.

- w.* Anal rays 23-21; depth 2.6-3.3; lateral line 33-35; a well-defined humeral spot.
26. *collecti* (Steindachner).
- ww.* Anal rays 18-20; depth 3.33-3.66; lateral line 32-34. . . . . 27. *copci* (Steindachner).
- oo.* A large, conspicuous black spot on the base of the caudal; origin of ventrals equidistant from tip of snout and base of caudal.
- x.* Second suborbital leaving a wide naked area; five or six teeth in the inner series of the premaxillary; gill-rakers about 9 and 15, one half as long as eye; 2.5 scales between lateral line and front of anal; middle caudal rays jet black, the color spreading over the base of the fin. Depth 3.25; A. 19; eye greater than interorbital.
28. *ccros* Eigenmann.
- xx.* Second suborbital leaving a very narrow naked area; five teeth in the inner series of the premaxillary; gill-rakers 7 and 9, one fifth as long as eye; 2.5-3.5 scales between lateral line and front of anal; a very large and conspicuous vertically oval spot occupying nearly all the base of the caudal to near the tip of the middle rays, bordered by milk-white; depth 3+; A. 20 or 21; eye about equal or less than interorbital.
29. *cotinho* Eigenmann.

# 1. MOENKHAUSIA BONDI (Fowler).

Plate 14, fig. 3; Plate 100, fig. 7.

*Phenacogaster bondi* FOWLER, Proc. Acad. nat. sci. Phil., 1911, p. 419 (Corisal, Venezuela).

*Moenkhausia profunda* EIGENMANN, Mem. Carnegie mus., 1912, 5, p. 322, pl. 46, fig. 1 (Issorora Rubber Plantation).

HABITAT.—Northern Guiana and Venezuela.

I have been able to examine the type of *M. bondi* in the collections of the Academy of Natural Science in Philadelphia and 2207 C. Type of *M. profunda*, 51 mm. Issorora Rubber Plantation. Shideler.

Head 4; depth 1.66-1.8; D. 11; A. 33; scales 8-34-7 (9 to the anal). Eye 2.6; interorbital 2.5.

Very much compressed; the ventral profile nearly a regular section of a circle; dorsal profile not so greatly and less regularly arched; preventral area very narrowly rounded, without a median series of scales, the lateral scales small and their margins bent over the median ridge; predorsal area narrow,

sealed, but without a distinct median series, the scales along the ridge much smaller than those of the sides.

Occipital process reaching one third of the distance to the dorsal, bordered by about five scales on each side; interorbital slightly convex; mouth small; maxillary with the anterior margin convex, equal to snout and anterior width of iris or snout and half the eye. Second suborbital leaving a considerable naked area; maxillary with two teeth, premaxillary with four teeth in the outer series, five in the inner; mandible with four strong teeth, five-pointed, abruptly minute teeth on the sides.

Gill-rakers about a third as long as the eye.

Scales thin, with a few feeble diverging striae, margins convex; anal with a sheath of two rows of scales; lateral line almost straight; no interpolated rows of scales.

Origin of dorsal considerably behind the ventrals, three in the length; anal long, but little emarginate, its origin and base of last dorsal ray equidistant from the snout; pectorals reaching about to middle of ventrals; ventrals not to anal.

A diffuse humeral band followed after a light band by a fainter dark band.

This species is technically a *Moenkhausia*. In reality its relationship is with *Ephippicharax* of another subfamily. It differs from *Ephippicharax* in not having a movable predorsal spine.

## 2. *MOENKHAUSIA LATISSIMA* Eigenmann.

Plate 5, fig. 2.

*Moenkhausia latissimus* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 101 (Tabatinga); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437.

HABITAT.—Tabatinga.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20762 } 20769 }	22	about 55-92	Tabatinga	Bourget

This species, resembling *Entomolepis steindachneri* in its coloration, compressed preventral region, and keeled predorsal area, is easily distinguished by its entire scales, small nuchal scale, and much longer anal fin.

Head 3.75; depth 2 on an average; D. 11; A 33-35;<sup>1</sup> scales 5.5 or 6-33-36-6.<sup>2</sup> Eye 2.75-4; interorbital 2.5.

Very deep, compressed, profile slightly depressed over eye, ventral and dorsal profiles about equally arched; preventral area narrowly rounded or keeled; postventral area compressed; predorsal area sharply compressed and keeled, with a few notched median scales, further forward the scales of the sides are bent over the sharply compressed area; postdorsal area narrowly rounded.

Occipital process narrow and long, two sevenths in the length to the dorsal, bordered by four scales; interorbital broad, rounded; fontanelles narrow, the anterior less than half as long as the posterior which is continued as a groove to the tip of the occipital process; second suborbital large, striate, leaving a narrow naked area between it and the lower limb of the preopercle; maxillary three in head, mandible 2.33. Usually four, rarely three or five teeth in the outer series of the premaxillary, the second and third close together, the third removed from the line of the others, five teeth in the inner series; two, rarely three, in one case one and in one four teeth in the maxillary; lower jaw with four graduated teeth and numerous minute ones.

Gill-rakers 8 + 11, the longest two thirds as long as the pupil.

Scales regularly imbricate, the exposed margin of those on the caudal peduncle but little lower than that of those on middle of the sides, the width of the exposed part a little more than half of the height; a few divergent striae, the margins not erenate; nuchal scales not enlarged; anal sheath composed of two series of scales in front, of a single one behind; lateral line but little decurved, caudal lobes sealed for at least half their length.

Dorsal about equidistant from tip of snout and base of caudal; its height three and a half in the length, its tip when laid back removed by five scales from the adipose. Lower caudal lobe somewhat the longer, three and a fourth in the length; anal emarginate, origin of anal and last dorsal ray equidistant from tip of snout; origin of ventrals below the third scale in front of the dorsal, equidistant from tip of snout and origin of last third of anal, reaching to or nearly to the anal; pectorals reaching the tip of the axillary scale.

No caudal spot; a well-defined, narrow, but very long, humeral spot reaching from above the third to above the ninth scale of the lateral line, on the upper part of the series of scales above the lateral line and the lower part of the series

<sup>1</sup> Of seventeen one has thirty-one, six have thirty-three, five have thirty-four, four have thirty-five and one has thirty-six.

<sup>2</sup> Of sixteen two have thirty-three, two thirty-four, seven thirty-five, five thirty-six.

next above that. The spot is rounded behind, pointed in front, and bordered by a lighter area; horizontal dark lines between successive series of scales.

Vertebrae 11 + 19.

Posterior air-bladder bent conical, its diameter greater than that of the eye, two and a half in its length; anterior air-bladder one and a half in the length of the posterior.

Alimentary canal about equal to the length; containing insects and small fishes.

### 3. *MOENKHAUSIA JAMESI* Eigenmann.

Plate 5, fig. 1, Plate 100, fig. 8.

*Moenkhausia jamesi* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 102 (Iça; Obidos; Lago do Maximo; Tajapurú); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437.

HABITAT.—Amazon Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20816 Cotypes	2	62, 68	Iça	James.
20827 Cotypes	1	53	Obidos	James.
3734 C.	12	50-68	Santarem	Haseman.
3735 C.	1	65	Rio Mamoré	Haseman.

Head 4; depth 2.2; D. 11; A. 32-35; scales 7-35 to 37-5 (to ventrals). Eye 2.4-2.66; interorbital equals eye.

Deep, compressed, ventral profile slightly more arched than dorsal, symmetrically rounded; dorsal profile slightly humped at the end of the occipital process; preventral area flattish, with a median series of scales and a lateral, angularly bent series; postventral area compressed, very narrowly rounded; predorsal area narrowly rounded, with a median series of ten scales reaching from the dorsal to the occipital process.

Occipital process moderate, bordered by four scales on each side; interorbital distinctly and evenly convex; second suborbital leaving a narrow naked area; mouth very small, maxillary short and anteriorly convex, not nearly reaching to end of first suborbital, its length equal to that of the snout. Three or four tricuspid teeth in the outer series of the premaxillary, the second or third very slightly removed from the line; five tricuspid or quinquecuspid graduated teeth in the second row; five rather small, graduated teeth in each side of

the lower jaw, followed by a few minute ones on the side; maxillary without teeth.

About 8 + 12 gill-rakers, about one third as long as the eye.

Scales deeply imbricated, with a few divergent striae; anal sheath of one or two series of scales which are well demarked from the lateral scales; caudal lobes scaled to near their tip; lateral line scarcely decurved; the rows of scales above it and below it parallel with it.

Origin of dorsal nearer the tip of the snout than the base of the caudal; origin of ventrals a little nearer to the tip of snout than the dorsal, equidistant from tip of snout and about end of anal; highest dorsal ray a little more than three in length, the shortest more than two and a half times in the longest. Anal distinctly emarginate in front, the fourth ray two and three tenths times as long as the fourteenth; ventrals scarcely reaching anal, pectorals to ventrals.

A dark vertical caudal spot on the base of the caudal, sometimes on base of all but the outermost rays; the spot not continued on the middle rays; a silvery lateral band half as wide as the eye; an ill-defined vertical humeral spot crossing the space between the fourth and seventh scales of the lateral line; no other dark markings; iridescent, silvery, and brassy.

#### 4. *MOENKHAUSIA JUSTAE* Eigenmann.

*Moenkhausia justae* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 102 (—); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437.

One specimen 21014 Type 60 mm.

This species is very similar to *M. jamesi* from which it differs in having a tooth on the maxillary; the teeth four- or five-pointed, four teeth on each side of the lower jaw. A. 31: scales 7–36–6; the second preorbital much narrower than in *M. jamesi*.

The exact locality is unknown. The specimen came with others from Dr. Justa through Major Coutinho and was probably found in the neighborhood of Manaos.

#### 5. *MOENKHAUSIA DOCEANA* (Steindachner).

Plate 14, fig. 1.

*Tetragonopterus doceanus* STEINDACHNER, Süßw. südöstl. Bras., 1876, **3**, p. 14 (Rio Doce); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1895, **14**, p. 52; ULREY, Ann. N. Y. acad. sci. 1895, **8**, p. 277. *Moenkhausia doceana* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437.

HABITAT.—Rio Doce, Rio Mucuri.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20909	38	69-106	Rio Doce	Hartt & Copeland.
20914	4	61-70	Porto Alegre	Hartt & Copeland.
20879 } 20880 }	12	64-106	Sao Matheos	Hartt & Copeland.

This species has hitherto been known from the types only. It is the only species of *Moenkhausia* in the coastwise streams of eastern Brazil, south of the Rio San Francisco.

There can be no doubt about the identification, although Steindachner says that the entire maxillary border is toothed.

Head 3.7; depth  $2+ -2.4$ ; D.11 (rarely 12); A. 34-38<sup>1</sup>; scales mostly removed, 7 or 8-34 to 37-6 or 7. Eye 2.14-2.5; interorbital 2.7-3.25.

Much compressed, the ventral profile regularly arched from the chin to the end of the anal; dorsal outline arched as much as the ventral, but less regularly; the occipital process rising rapidly, the profile of the head correspondingly concave; preventral area rounded, with a median series of scales; predorsal area trenchant, with a median series of about eleven scales.

Occipital process a little less than one third of the distance from its base to the dorsal, bordered by about five scales on each side; interorbital convex; frontal fontanel not much shorter than the parietal exclusive of the groove on the occipital process; second suborbital leaving a naked area about one fourth as wide as the covered portion; length of maxillary equals the distance from tip of snout to pupil; mandible equals distance from tip of snout to end of maxillary; usually five teeth in the front row of the premaxillary, the third tooth removed from the line, more rarely three or four teeth; five, more rarely six, teeth in the second series; maxillary most frequently with five teeth; of the maxillaries examined two have three, four have four, twelve have five, six have six, six have seven, and two have eight teeth; mandible with four large teeth, frequently a smaller one on the side, and then a series of minute ones.

Gill-rakers about  $8 + 13$ , one third the diameter of the eye.

Scales caducous, entire, with a few diverging striae, regularly imbricate; anal sheath of a single series of scales; caudal lobes sealed for a third of their distance at least; lateral line very little decurved, the scales below it parallel with it, a few auxiliary scales over the muscles of the anal.

<sup>1</sup>Of seventeen specimens examined two have thirty-four, one thirty-five, six thirty-six, seven thirty-seven, and one thirty-eight rays.



Origin of dorsal a little in advance of the middle, its height four in the length; caudal large, the lower lobe slightly longer, about one third of the length; anal basis equals distance from dorsal to caudal, its origin equidistant from tip of snout and base of middle caudal ray; anal emarginate, the highest anterior ray twice the height of the fifteenth ray; ventrals reaching beyond origin of anal, equidistant from tip of snout and last third of the anal; pectorals reaching to middle or the second third of the ventrals.

A large, horizontally oval, humeral spot, nearly two thirds as long as the head; a silvery lateral stripe not much more than half the width of the pupil; general color, including all the fins dark, the fins with numerous pigment cells.

Vertebrae 12 + 20.

Alimentary canal not equal to the total length. Contains ants in the one dissected.

*Measurements of eleven specimens M. C. Z. 20909.*

Specimen	Dorsal	Anal	Length	Depth	Head	Eye	Inter- orbital	Premax- illary teeth	Maxil- lary teeth
			mm.	mm.	mm.	mm.	mm.		
1	11	34	80	38	21	8.5	8	5 <sup>1</sup> -5 <sup>2</sup>	5 <sup>3</sup> -6 <sup>4</sup>
2	11	36	81	38	20	8	7	5-5	5-4
3	11	37	80	35	19	8	7	5-5	3-7
4	11	36	78	33	19	8	6.5	5-5	6-7
5	12	37	52	22	14	6.5	4.5	5-5	5-6
6	11	36	56	22	15	6	5	5-6	5-5
7	11	37	49	20	13	6	4.5	{ 4-5 3-6	7-5
8	11	36	48	20	13	6	4	4-5	7-7
9	11	37	69	29	18	8	6	5-5	6-5
10	11	39	64	26	16	7	5	4-5	4-4
11	11	36	59	25	15	7	5	5-5	8-7

6. MOENKHAUSIA CHRYSARGYREA (Günther).

Plate 6, fig. 3; Plate 100, fig. 9, 10.

*Tetragonopterus chrysargyreus* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 328 (Essequibo); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 281.

*Moenkhausia chrysargyrea* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 45. Mem. Carnegie mus., 1912, **5**, p. 323.

*Moenkhausia chrysargyrea leucopornis* FOWLER, Proc. Acad. nat. sci. Phil., 1914, p. 245 (Rupununi).

HABITAT.—Essequibo, Amazons.

<sup>1</sup> Front row.

<sup>2</sup> Second row.

<sup>3</sup> On one maxillary.

<sup>4</sup> On the other.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3070 C. 11841 I.	43	51-61	Rockstone, Essequibo River	Eigenmann.
1371 C. 11842 I.	7	51-91	Crab Falls, Essequibo River	Eigenmann.
1372 C. 11848 I.	15	53-69	Konawaruk, Essequibo River	Eigenmann.
1366 C.	1	58	Warraputa Cataract, Essequibo River	Eigenmann.
1373 C. 11844 I.	25	52-101	Packeeo Falls, Essequibo River	Eigenmann.
1374 C. 11845 I.	10	60-87	Tumatumari, Potaro River	Eigenmann.
1375 C.	1	60	Wismar, Demerara River	Eigenmann.
1376 C. 11846 I.	2	58-60	Rupununi River	Grant.
20754	3	About 45-70	Tabatinga	Bourget.
20705	1	About 60	Teffé	Agassiz.
20851	2	About 68 and 75	Jutahy	James, Thayer, and Talisman.
21003 } 21005 }	5	About 56-54	José-Fernandez	Coutinho.

Head 3.5-4; depth 2.4 in young, 2 in old; D. 11; A. 27-30; scales 7-33 to 34-5. Eye 2.5-2.75 in head; interorbital equals eye.

Deep, compressed, subrhomboidal, the anal basis straight, nearly parallel with the upper anterior profile in the young, more oblique in the oldest; profile depressed slightly over the eyes and rounded above the occipital process. Pre-ventral area rounded, with a median series of scales, the lateral series not sharply angulated except just in front of the ventrals; predorsal area keeled, with a median series of about 10 scales from the dorsal to the occipital crest.

Occipital process long, equal to one third of the distance from its base to the dorsal, bordered on the sides by three scales; second suborbital leaving a narrow naked area which is widest below; maxillary not nearly reaching end of first suborbital, but little beyond anterior margin of eye, its length equal to distance from tip of snout to pupil. Four or five teeth in the outer series of the premaxillary; five or six five-pointed, graduated teeth in the inner series; maxillary with one or two minute teeth; lower jaw with four large graduated teeth on each side and many minute ones.

Gill-rakers about 6 + 14, one third as long as eye.

Scales deeply imbricate, with several divergent striae; anal sheath of two scales in front; caudal lobes scaled for more than half their length. Lateral line somewhat descending, parallel with the row of scales below it.

Origin of dorsal equidistant from tip of snout and base of caudal, its highest

ray three in the length; ventrals a little nearer to tip of snout than the dorsal, about equidistant from tip of snout and end of anal; ventrals reaching to anal somewhat shorter in old specimens; pectorals reaching two scales beyond ventrals; anal emarginate, the highest ray about two thirds the length of the base. Iridescent silvery. A deep lying, well-defined, horizontally oval, circular or rhomboidal, black, humeral spot over the space between the fifth to the eighth scale of the lateral line and at least the width of a scale removed from it; a few scattered cells nearer the surface extend from the front of the spot across the lateral line; humeral spot surrounded by a light court behind which there is a faint vertical bar; a narrow silvery lateral line, its width equal to about one fourth the length of the maxillary; no caudal spot; sides variously dotted with chromatophores. In the Tumatumari specimens the scales of the abdomen are margined with dark, there being faint streaks following the rows of scales. Scales of the second row below the dorsal each with an oblique dark band noticeable only with a lens; outer margin of pectoral and ventral dark; middle of anal lobe and bases of the remaining rays yellow; dorsal rays each tinged with yellow at its middle, pectoral tinged with yellow; upper part of iris red. Vertebrae 11 + 19.

Posterior section of air-bladder about twice as long as anterior; its width about equal to the eye; bent down behind and reaching to near the origin of the anal.

#### 7. MOENKHAUSIA COMMA Eigenmann.

Plate 6, fig. 2.

*Moenkhausia comma* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 102 (Cudajas); Rept. Princeton univ. Exped. Patagonia, 1910, 3, p. 437.

One specimen 20972 part Type 77 mm. Cudajas Thayer and Bourget.

A second specimen in very bad condition of the same length and from the same place.

This species can readily be distinguished by its elevated dorsal, and the peculiar humeral spot.

Head 3.4; depth 2+; D. 11; A. 26; scales 6-32(?) -5. Eye 2.5; equal to interorbital.

Deep, compressed, subrhomboidal, the anal basis much steeper than the predorsal profile. Profile very slightly depressed over the eye. Preventral area narrowly rounded, the lateral series of scales without a distinct bend. Postventral area compressed; predorsal area narrowly compressed and keeled, with eight median scales between occipital process and dorsal.

Occipital process long, equal to one third of the distance between its base and the dorsal, bordered on the side by three scales. Second suborbital leaving a naked border distinctly wider than in *M. chrysargyreus*; maxillary rather longer than the distance from tip of snout to pupil, a little more than three in the head.

Three to six teeth<sup>1</sup> in the front row of the premaxillary, five or six in the second row; maxillary with two small teeth; mandible with four large teeth and numerous small ones on the side.

Gill-rakers 7 + 15, a little more than half the length of the pupil.

Scales regularly imbricate, each with a few divergent striae, the exposed portion of those on the caudal peduncle about two thirds of the depth of the exposed portions of those on the middle of the sides; anal sheath composed of two scales in front; (all but one of the caudal scales missing); lateral line but little decurved.

Origin of dorsal a little nearer tip of snout than to caudal, the anterior rays elevated, three in the length, reaching adipose when depressed; caudal lobes equal to height of dorsal; origin of anal equidistant from tip of snout with a point midway between the dorsals, the margin damaged but evidently emarginate, the highest anterior ray reaching at least to the base of the seventh from the last when depressed; ventrals reaching anal, one and a half in the head, their origin equidistant from tip of snout and caudal; pectorals reaching beyond origin of ventrals.

A deep lying, well-defined humeral spot, beginning in a point above the origin of the lateral line increasing in width backward and ending above the seventh scale of the lateral line; a very narrow, silvery lateral line; upper posterior part of the interradiar membranes of the dorsal dark; remaining fins hyaline.

Vertebrae 11 + 19.

#### S. *MOENKHAUSIA MELOGRAMMA* Eigenmann.

Plate 6, fig. 1; Plate 100, fig. 4.

*Moenkhausia melogrammus* EIGENMANN, Bull. M. C. Z., 1908, 62, p. 402 (Tabatinga); Rept. Princeton univ. exped. Patagonia, 1910, 3, pt. 4, p. 437.

One specimen 20825 Type 40 mm. to base of caudal Tabatinga Bourget

Readily distinguished by the depth and by the black line along the base of the anal.

<sup>1</sup> In the type there are four on the left side and five on the right, but one has evidently been lost from the latter; in the second specimen there are five on the left and three on the right side.

Head 4; depth 2.5; D. 11, counting the divided ray as 2; A. 26; scales 6-34-4. Eye equals twice the length of the snout, 2.4 in the head; interorbital 3 in the head.

Compressed, dorsal and ventral profiles nearly equally curved, the ventral more regularly; profile slightly depressed over eye; preventral area rounded, postventral area compressed; predorsal area slightly keeled, with a median series of ten scales from dorsal to occipital crest.

Occipital process a little more than one fifth of the distance between its base and the dorsal, bordered by three scales on each side; interorbital very slightly convex; second suborbital leaving a naked area on cheek which is widest below; maxillary not reaching to the end of the first suborbital, equal to the distance from tip of snout to pupil. Five teeth in the front row of the premaxillary, the third *entirely* withdrawn from the line of the rest; five graduated teeth in the inner series; two teeth on the maxillary; four graduated, large teeth on each ramus of the lower jaw followed by smaller ones on the side.

Scales deeply imbricate, with a few not greatly divergent striae; anal without a sheath (in this specimen only?); caudal lobes covered with caducous scales for at least half their length; lateral line scarcely descending in front. Origin of dorsal equidistant from tip of snout and base of caudal, distinctly further from tip of snout than the ventrals; ventrals equidistant from tip of snout and base of penultimate anal ray, reaching not quite to anal, pectorals to ventrals. Anal probably emarginate.

A black line along the base of the anal; a faint dark line along the sides, otherwise faintly silvery without spots.

## 9. MOENKHAUSIA OLIGOLEPIS (Günther).

Capaule of the Potaro Indians.

Plate 7, fig. 4; Plate 95, fig. 4; Plate 100, fig. 5.

*Tetragonopterus oligolepis* GÜNTHER, Cat. fishes Brit. mus., 1861, **5**, p. 327 (British Guiana), EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 282; VAILLANT, Bull. Mus. hist. nat., 1899, **5**, p. 155 (Carnot).

*Moenkhousia oligolepis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437; Mem. Carnegie mus., 1912, **5**, p. 321, pl. 46, fig. 3.

*Tetragonopterus agassizii* STEINDACHNER, Ichthyol. beitr., 1876, **5**, p. 41, pl. 8, fig. 2 (Tabatinga; Cudajas; Hyavary); COPE, Proc. Amer. philos. soc., 1878, **17**, p. 691 (Peruvian Amazon); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 281.

?*Astyanax otahualpianus* FOWLER, Proc. Acad. nat. sci., Phil., 1906, p. 436, fig. 36 (Pebas).<sup>1</sup>

?*Moenkhousia atahualpiana* EIGENMANN, Rept. Princeton univ. Exped. Patagonia, 1910, **3**, p. 437.

<sup>1</sup>This species is said to have: Head 3.3; depth 2.75; D. 12; A. 24; lat. 1. 26-27.

HABITAT.—Amazons and north to Guiana.

I have examined the types of *T. oligolepis* and there is no doubt but that they are identical with *T. agassizii*.

*Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
20756, 20759, 20761, 20775	106	41-95	Tabatinga	Bourget
20854	1	59	Jutahy	James, Thayer, and Talisman
20808	1	85	Manacapuru	James
20729	8	about 50-66	Lake Hyanuary	Agassiz
20693	8	54-65 (to base of caudal)	Goyaz	
20966, 20972, 20963, 20974, 20975	118	45-85	Cudajas	Thayer and Bourget
21018	81	59-90	Curupira	Coutinho
1361 C., 11835 I.	30	35-96	Holmia, Upper Potaro	Eigenmann.
1362 C., 11836 I.	11	39-118	Arnataima Cateract, Upper Potaro	Eigenmann and Grant
1363 C., 11837 I.	11	33-53	Potaro River, 2 hrs. be- low Holmia	Eigenmann
1364 C., 11838 I.	7	28-44	Savannah Landing, Upper Potaro	Eigenmann
1365 C., 11339 I.	3	37-61	Erukin, a tributary of the Potaro below Amatuk.	Eigenmann
1367 C.	1	88	Potaro Landing	Eigenmann
1368 C., 11840 I.	8	40-47	Tumatumari	Eigenmann
1369 C.	1	78	Maripieru, branch of Ireng.	Grant.

Head 3.64; depth 2.25 on an average; D. 11; anal most frequently 25 or 26<sup>1</sup>; scales 5-30 to 31-4<sup>2</sup>. Eye 2.5-3 in the head; interorbital wider than eye.

Rather deep, compressed, especially above the anal; ventral profile somewhat more arched than the dorsal, no distinct humps or depressions, the outline subrhomboidal. Preventral area narrowly rounded or with an indistinct median keel, no lateral keels except in the very largest; postventral area compressed, with a median series of bent scales, the scales bordering it not much smaller than those above it; five scales from the median scale to the lateral line;

<sup>1</sup> Of fifty-two specimens, two have twenty-three, six have twenty-four, nineteen have twenty-five, fourteen have twenty-six, ten have twenty-seven, and one has twenty-eight.

<sup>2</sup> Of fifty specimens among those in the M. C. Z., six have twenty-nine, twenty-five have thirty, sixteen have thirty-one and three have thirty-two scales in the lateral line.

predorsal area rounded, with an obscure median keel; eight scales between the dorsal and the occipital process; postdorsal area rounded.

Occipital process equal to about one fifth the distance from its base to the dorsal, bordered by two or three scales on the sides; interorbital broad, but little convex, the frontal fontanel narrower and about half as long as the parietal; second suborbital very broad, covering the entire cheek or leaving a very narrow naked border behind; maxillary but little longer than snout, more than three in the length of the head; four or five teeth in the front row of the premaxillary, the third withdrawn from the line, the second and third and sometimes the fourth close together; five teeth in the inner series; usually two teeth on the maxillary; mandible with four large teeth and a number of minute ones on the sides.

Gill-rakers about  $8 + 11$ , a little more than half the length of the pupil.

Scales very regularly imbricate, the exposed edge of those on the caudal peduncle about two thirds as high as that of the largest scale on the middle of the sides; scales above the lateral line in specimens 50 mm. long with about four nearly parallel striae, in the largest with 6-10 striae, frequently a notch in the margin of the scale at the end of a line; anal sheath composed of two or three series of small scales in front of a single series behind; caudal lobes scaled to near their tip; lateral line nearly straight from its sixth scale; axillary scale well developed.

Dorsal equidistant from tip of snout and base of caudal, its highest ray nearly four in the length, its eighth ray about two thirds of the height of the second. Anal emarginate in the young, the highest ray reaching base of fifth from the last; not emarginate in the adult but the anterior rays two and a half times as long as the one next to the last; origin of the ventrals equidistant from tip of snout and tip of last anal ray, nearly or quite reaching the anal in the young; pectorals beyond origin of ventrals for one or two scales.

Dorsal, adipose, ventrals, and anal pink to orange; upper part of iris red, the rest golden. A broad black band across the end of the caudal peduncle and base of caudal, distal part of all the caudal rays light pink; in life a faint vertically oval humeral spot; no silvery lateral band; color otherwise variable in intensity with the locality, the margins of all the scales dark, the centers light; in life the younger ones have the adipose and caudal peduncle bright yellow.

Vertebrae  $12 + 16$ .

Posterior air-bladder as wide as and three times as long as eye, twice as long as the anterior, curved down behind to near the origin of the anal.

Alimentary canal not quite equal to the length, without the caudal.

## 10. MOENKHAUSIA SANCTAE FILOMENAE (Steindachner).

## Plate 16, fig. 1, 2.

*Tetragonopterus agassizii* BOULENGER (non Steindachner), Bull. Mus. univ. Torino, 1895, **10**, no. 196, p. 3 (Colonia Rizzo); Trans. Zool. soc. London, 1896, **14**, p. 35 (Descalvados and Monte Sociedad);

Boll. Mus. univ. Torino, 1897, **12**, no. 279, p. 4 (San Lorenzo); 1900, **15**, no. 370, p. 2 (Urucum).

*Poecilurichthys agassizii* EIGENMANN, Proc. Acad. nat. sci., Phil., 1903, p. 522 (Arroyo Trementina; Arroyo Chagalalina).

*Moenkhausia agassizii* EIGENMANN, Ann. Carnegie mus., 1907, **4**, p. 138, pl. 12, fig. 2 (Corumba).

*Tetragonopterus sanctae filomenae* STEINDACHNER, Anz. K. akad. wiss. Wien, 1907, p. 82 (Sancta Filomena, Parnahyba).<sup>1</sup>

*Moenkhausia australe* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 102.

HABITAT.—Paraguay Basin, Rio Parnahyba, and southern Madeira.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
9991 I.	1	41 (to base of caudal)	Arroyo Trementina	Anisits
9992 I.	1	32 (to base of caudal)	Arroyo Chagalalina	Anisits
3315 C.	2	41-68 (to base of caudal)	Jauru	Haseman
2998 C.	1	55	Barreiras, Lagoas of Rio Grande	Haseman
3307 C.	2	39-49	Cacequy	Haseman
2999 C.	1	49	San Francisco	Haseman
3303 C.	10	33-66	Rio Sapon, Prazer, Bahia	Haseman
3304 C.	4	32-69	Above Cachoeira da Velha, Rio Novo, Goyaz	Haseman
5305 C.	1	47	Rio Tieté above the fall	Haseman
3306 C.	1	34	Salto das Cruzes, Rio Tieté	Haseman
3308 C.	10	36-43	Arequa, Lake Ipaearary, Paraguay	Haseman
3310 C.	2	42-43	Corumba	Haseman
3309 C.	4	40-45	Puerto Suarez	Haseman
3311 C.	22	36-65	San Luiz de Caeres	Haseman
3312 C.	8	32-67	San Luiz de Caeres	Haseman

<sup>1</sup> The following is an abstract of Steindachner's description of the types:—

Head 3.6-3.5; depth 2.25-2.2. A. 25-27; scales 4.5-22 to 24-3.5; eye nearly 3 in head; inter-orbital 2.33-2.

Interorbital slightly convex; snout equals eye; maxillary not reaching center of eye; mandibular teeth brown, darkest at tip; two small teeth on maxillary.

Origin of dorsal equidistant from caudal and front of eye; ventral in front of vertical from dorsal; pectoral reaching ventral, ventral not to anal.

Lateral line frequently interrupted, skipping several scales in the posterior part of the body.

Silvery dark above; scales margined with darker; humeral spot not sharply demarked, rounded or oval; caudal spot deep, dark brown, very large, forming a crossband in base of caudal.



Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3313 C.	2	42-43	Rio Santa Rita	Haseman
3314 C.	6	40-50	Rio Boa Ventura	Haseman
3315 C.	5	39-47	San Joaquin	Haseman

This species differs from the Amazonian *M. oligolepis* in having usually but twenty-five scales in the lateral line instead of thirty or thirty-one.

In many of the smaller specimens the lateral line is either interrupted, *i. e.* it skips a scale or more, or it is incomplete. The incompleteness is positively correlated with the shorter lateral line. This is especially well brought out in the specimens from San Luiz de Caceres. These specimens with a complete lateral line have usually thirty scales in the lateral line, while those with an incomplete lateral line have usually only twenty-five though of the former one has but twenty-five and of the latter one has as many as twenty-eight scales in the lateral line. Out of eighty-four specimens examined twenty-nine have imperfect lateral lines.

The count of the anal rays and lateral lines is given in detail for different localities in the first part of the following table, and summarized in the second part of the table for those specimens of both *M. oligolepis* and *sanctae filomenae* in which the character of the entire line could be determined.

		Anal rays							Scales in the lateral line											
Locality	Species.	22	23	24	25	26	27	28	22	23	24	25	26	27	28	29	30	31	32	
Amazon	oligolepis	...	2	6	19	14	10	1	...	...	...	...	...	...	...	6	25	16	3	
Rio Sapon	sanctae filomenae	3	6	...	...	...	...	...	1	1	4	3	1	...	...	...	...	...	...	
Rio Tieté	sanctae filomenae	...	1	...	1	...	...	...	...	1	...	1	...	...	...	...	...	...	...	
Rio Santa Rita	sanctae filomenae	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Cacequy	sanctae filomenae	...	...	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	
Cachoeira	sanctae filomenae	...	...	2	1	...	...	...	...	1	1	2	...	...	...	...	...	...	...	
Arequa	australe	...	...	1	4	...	...	...	...	1	2	...	...	...	...	...	...	...	...	
Corumba	australe	...	...	1	1	...	...	...	...	...	...	2	...	...	...	...	...	...	...	
Puerto Suarez	australe	...	...	1	2	...	1	...	1	...	...	2	1	...	...	...	...	...	...	
Rio Boa Ventura	australe	1	1	3	...	...	1	...	...	1	1	1	3	...	...	...	...	...	...	
Rio Jauru	australe	...	...	...	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...	
Caceres *	oligolepis?	...	3	3	1	1	...	...	...	...	...	1	...	...	...	...	5	1	...	
Caceres *	australe	...	1	2	4	...	...	...	...	...	...	5	1	...	1	...	...	...	...	
Totals		4	14	21	35	15	12	1	1	5	8	18	7	...	1	6	30	17	3	

Correlation between completeness of the lateral line and anal and number of scales in the lateral line.

Lateral line complete	2	9	8	9	15	12	...	...	2	3	7	2	...	...	6	29	17
Lateral interrupted	1	2	2	1	...	...	...	1	2	2	2	1	...	...	1	...	...
Lateral line incomplete	2	4	6	11	...	...	...	1	2	2	12	4	1	...	...	...	...

In the specimens with the lateral line imperfect the scales along the lateral line series are as follows, the scales with pores being in italics:—<sup>1</sup>

Corumba *10 + 15*; *8 + 16*; Puerto Suarez *8 + 14*; Caceres *22 + 1 + 49*; *22 + 3 + 3*; *8 + 17*; *10 + 15*; *9 + 16*; *10 + 16*; *9 + 16*; *8 + 17*; Rio Boa Ventura *8 + 16*; *10 + 16*; *10 + 16*; *3 + 1 + 3 + 16*; *9 + 17*; Rio Sapon *6 + 18*; *19 + 2 + 2*; *12 + 1 + 3*; Cachoeira *12 + 2 + 9 + 1*; *14 + 2* or *3 + 9*; *15 + 1 + 8 + 1*; Rio Tieté *13 + 11* and two small ones with short lateral line; Caceguy *15 + 3 + 7 + 1*; Arequa *8 + 16*; *10 + 15*; *10 + 15*; Rio Jauru *11 + 14*; San Joaquin *8 + 17*; *10 + 17* (and three others with an incomplete line). In the other specimens the lateral line is complete.

Summarizing the data we find that there are two groups of specimens. The first consist of one with six scales with pores, seven with seven scales, three with nine scales, eight with ten scales, one with eleven and one with thirteen scales with pores. In each of these cases the remaining scales of the series are without pores.

To this series also belongs one specimen in which the lateral line series consists of three pores, one scale without a pore, three with pores and sixteen without pores. This is evidently a modification of seven scales with pores and sixteen without pores. Most of these come from the Paraguay and Paraná Basins and represent *M. australe*.

In the remainder of those enumerated the modifications are of another sort. The lateral line reaches the caudal or within one scale of the caudal, but is interrupted, skipping one, two, or three scales. All of these with the exception of two from Caceres came from southeastern Brazil and represent *M. sanctae filomenae*. It is scarcely possible that they indicate the road from the complete lateral line to the incomplete, for in those with the incomplete lateral line the number of scales at the beginning of the line with pores is usually eight to ten, and specimens having this character occur at the same locality with others with complete lateral lines. In those with the interrupted lateral line there are from fourteen to twenty-two scales at the beginning of the line with pores, and while these also occur along with others with complete lateral line, they in general are found in other river basins in an area geographically widely separated from the area in which those with incomplete lateral lines occur.

There seem to be variations (constantly occurring or mutations) in two different directions, one of these directions leads to *Hemigrammus* which is a

<sup>1</sup> I am indebted to Mrs. Marion Durbin Ellis for the examination of these specimens in connection with her study of *Hemigrammus* and *Hyphessobrycon*.

Moenkhausia with an incomplete lateral line, the other leads towards the condition found in *Psellogrammus* in which the lateral line is always interrupted but continued to the caudal.

# 11. MOENKHAUSIA GRANDISQUAMIS (Müller and Troschel).

Plate 12, fig. 3; Plate 100, fig. 6.

*Tetragonopterus grandisquamis* MÜLLER & TROSCHER, Horae ichthyol, 1845, 1, p. 27, tab. 8, fig. 2 (Surinam); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 324 (British Guiana); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53.

*Moenkhausia grandisquamis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437; Mem. Carnegie mus., 1912, 5, p. 323; pl. 77, fig. 2.

HABITAT.—Guianas, Amazons.

## *Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
20694	19	about 64-91	Goyaz	Sn. Honario
20811, 20815	7	40-85	Iça	James
20981, 20979	3	70-97	Lago Alexo	Thayer
20977				
20875	1	66	Manacapuru	James
20988	2	45-52	Serpa	Thayer
20707		47-53	Villa Bella	Agassiz
20879 (part)	2	44-51	Obidos	James
20830, 20879 (part)	4	44-53	Obidos	James
20844	6	16-84	Obidos.	Col. Bentos
20739	3	60-75	Monte Alégre	Agassiz
20014	2	74		Justa
20725	14	poor	Gurupa	Agassiz
3736 C.	6	48-52	Santarem	Haseman
1348 C., 11857 I.	51	45-79	Bartica, Essequibo River	Shideler
1349 C., 11858 I.	66	51-86	Rockstone, Essequibo River	Eigenmann
1350 C., 11859 I.	35	50-115	Crab Falls, Essequibo River	Eigenmann
1351 C., 11860 I.	8	64-110	Tumatumari, Lower Potaro	Eigenmann
1352 C.	1	122	Cangaruma, Lower Potaro	Eigenmann
1353 C.	1	55	Wismar, Demerara R.	Eigenmann
3000 C.	1	54 <sup>1</sup>	Maciél, Rio Guaporé	Haseman

This species can very readily be distinguished from all others of the genus by the very widely diverging striae of the scales. The striae are very irregular

<sup>1</sup> To base of caudal July 23, 1909.

in the type forming a network in the median scales. In others they are more regular, rarely anastomosing but those from above and below meeting along the median line.

Head 3.5-4; depth usually 2 in the adult (2.4 in some of the specimens from Obidos and in the young). D. 10 or 11; A. usually 26-28<sup>1</sup>; scales 5-31 to 34<sup>2</sup>-4. Eye 2.33-2.5 in the head; interorbital equals eye, or but a trace larger.

Compressed, oval, without notable breaks in the nearly symmetrical curves; profile scarcely depressed over the eyes, ventral profile slightly more arched than the dorsal; preventral area with a median series of about twelve flat scales bordered on the sides by series of angularly bent scales; postventral area with a median series of moderate sized thin scales, bent and bordered on the sides with a series of symmetrical or nearly symmetrical scales, the area compressed; predorsal region narrowly rounded, the median series of about nine scales extending from dorsal to occipital crest.

Occipital process one fourth to one fifth in the distance from its base to the dorsal, bordered on the sides by three scales; interorbital very slightly convex; second suborbital leaving but very narrow naked border; maxillary not reaching to end of second suborbital, equal to the distance from tip of snout to pupil; four or five, rarely six, in one case seven, teeth in the front series of the premaxillary forming a continuous series on each side; the third tooth slightly behind the line of the others; five graduated teeth in the second row; four large teeth in the mandible, slightly graduated; minute teeth on the sides of the lower jaw, maxillary with one or two teeth.

Gill-rakers about 9 + 12.

Scales deeply imbricate with one to two pairs of widely divergent striae exposed and several pairs concealed; anal sheath consisting of one to three rows of minute scales in front and a single row behind, more or less sharply marked off from the scales of the sides; lateral line scarcely bent up in front, a well-developed axillary scale; caudal lobes densely scaled to near their tip.

Origin of dorsal a little in advance of middle. Its first divided ray two and a half times as long as the last, three and a half in the length; anal emarginate, the first rays at least twice the length of some of the posterior ones; origin of ventrals about equidistant from tip of snout and tip of last anal ray, equidistant from tip of snout with the dorsal; ventrals scarcely reaching anal in

<sup>1</sup> In thirty specimens from the Amazon Basin one has twenty-four, one twenty-five, seven twenty-six, ten twenty-seven, five twenty-eight, two twenty-nine, two thirty, and two thirty-two anal rays.

<sup>2</sup> Of nineteen specimens from the Amazon Basin, three have thirty-one, five thirty-two, eight thirty-three, and three thirty-four scales with pores.

the young, shorter in adult, pectorals to ventrals or the width of one scale farther in young, not to ventrals in the largest.

A round humeral spot over the third to fifth scales of the lateral line, disappearing with age; no caudal spot in adult, sometimes a dusky area at end of caudal peduncle in young; a distinct silvery lateral band, the width of the free margin of a row of scales; fins all plain, mostly hyaline; sides silvery, highly iridescent.

Air-bladder slender, not bent down behind to the anal, posterior section not twice as long as the anterior, abruptly narrowed behind; diameter at its widest part about equal to the eye. Alimentary canal about one and one third times the entire length with the caudal; intestines containing insects and vegetable fibers.

Vertebrae 11 + 18. Tip of occipital process not extending beyond the posterior face of the skull.

As stated above, specimens from Obidos are distinctly more elongate than others, whereas the largest specimen, the one from Cangaruma, is more than half as deep as long.

## 12. MOENKHAUSIA OVALIS (Günther).

### Plate 7, fig. 3.

*Tetragonopterus ovalis* GÜNTHER, Proc. Zool. soc. Lond., 1868, p. 245 (Xeberos); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 282; FOWLER, Proc. Acad. nat. sci., Phil., 1906, p. 441, fig. 38 (Marañon); REGAN, Ann. mag. nat. hist., 1913, ser. S, **12**, 281 (Ucayali).

*Tetragonopterus chalcus* COPE, Proc. Amer. philos. soc., 1878, **17**, p. 691 (Marañon).

*Moenkhausia ovalis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437.

HABITAT.—Marañon.

I have examined the type in the British Museum, represented in Plate 7, figure 2. It is evidently closely related to *M. grandisquamis*.

Head 3.66; depth 2; D. 11; A. 27; scales 5-31-4 (6 to anal). Eye 3 in the head, 1.33 in interorbital.

Upper profile rather more convex than the lower, scarcely concave at the nape; preventral area flat; maxillary with two teeth, extending somewhat beyond front margin of the eye; origin of dorsal just behind origin of ventrals; pectoral extending beyond the ventrals, ventrals to the vent. Humeral spot indistinct, caudal spot diffuse, extending over the base of the fin, not to the end of the middle rays.

## 13. MOENKHAUSIA BARBOURI Eigenmann.

Plate 7, fig. 1; Plate 100, fig. 1.

*Moenkhausia barbouri* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 103 (Villa Bella); Rept. Princetou univ. exped. Patagonia, 1910, 3, p. 437.

HABITAT.—Amazon Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20708 Cotypes	2	62, 65	Villa Bella	Agassiz
3723 C.	1	64	San Antonio, Rio Madeira	Haseman

Very similar to *M. grandisquamis*, the striae of the scales are different and the caudal lobes dark.

Head 4.2–4.3; depth 2.4; D. 11; A. 30–33; scales 5.5–37–4.5. Eye 2.5; interorbital slightly smaller than eye.

Compressed, moderately deep, the dorsal and ventral profiles symmetrically curved, without humps or depressions; preventral area rounded, with obscure lateral keels; postventral area narrowly rounded; predorsal area obscurely keeled, with a median series of nine scales from the dorsal to the occipital process.

Occipital process equals one fourth the distance from its base to the dorsal, bordered by three scales on the sides; the occipital fontanel continued as a groove to its tip; interorbital distinctly convex; second suborbital leaving but a very narrow naked border; maxillary 2.66 in head, equal to the distance from the tip of the snout nearly to pupil; four teeth in the front series of the premaxillary, five teeth in the second series; maxillary with a single tooth. Lower jaw with four large teeth in front and several minute ones on the sides. Gill-rakers about 7 + 13, the longest about one fourth of the eye.

Scales of the sides with four or more diverging striae; anal sheath consisting of a single series of scales; caudal lobes scaled for at least half their length; lateral line nearly straight.

Origin of dorsal equidistant from tip of snout and base of upper caudal lobe; ventrals equidistant from tip of snout and base of last but four rays of

anal, their distance from tip of snout slightly less than that of the dorsal; highest dorsal ray three and one half in the length, equal to the caudal lobes; anal but slightly emarginate, its highest ray reaching about to the base of the sixteenth ray, its base about one third of the length; ventrals not reaching to anal, and the pectorals not quite to the ventrals.

A faint vertical humeral spot; tips of caudal lobes and middle rays faintly dusky; a well-defined, silvery lateral band, two thirds as wide as the eye; sides iridescent silvery.

#### 14. MOENKHAUSIA XINGUENSIS (Steindachner).

*Tetragonopterus xinguensis* STEINDACHNER, Flussf. Südamer., 1882, **4**, p. 32 (Xingu); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 281.  
*Moenkhausia xinguensis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438.

This species is known only from the types.

“Head 3.33; depth 2.33; D. 11; A. 26; scales 5–32–4; interorbital 3 in the head, snout 3.6.

Dorsal profile a little more arched than ventral; interorbital nearly flat; maxillary narrow, reaching nearly to the vertical from the middle of the eye. Height of dorsal equals length of head; pectoral equals length of head without the snout, reaching ventrals; ventrals shorter than pectorals, reaching to anal; caudal slightly longer than head. Golden brown, lower parts of head silvery; humeral spot large, ill defined. No caudal spot. Differs from *lepidurus* in having fewer scales in the lateral line and in the greater depth.” Steindachner.

#### 15. MOENKHAUSIA BROWNI Eigenmann.

Conia of the Wacusi Indians.

Plate 12, fig. 2.

*Moenkhausia browni* EIGENMANN, Ann. Carnegie mus., 1909, **6**, p. 13 (Aruatima Falls, Potaro River); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438; Mem. Carnegie mus., 1912, **5**, p. 324, pl. 47, fig. 3.

HABITAT.—Potaro River both above and below the Kaieteur Fall.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1004 C. Type	1	66	Aruataima, Upper Potaro River	Eigenmann
Paratypes				
1005 C., 11711 L.	25	46-82	Holmia, Upper Potaro River	Eigenmann
1006 C., 11712 L.	12	28-68	Two hours below Holmia	Eigenmann
1007 C., 11713 L.	69	23-80	Savannah Landing above Kaieteur	Eigenmann
1008 C.	1	31	Creek below Savannah Landing above Kaieteur	Eigenmann
1009 C., 11714 L.	9	30-62	Tukeit, Lower Potaro River	Eigenmann
1010 C., 11715 L.	2	48-50	Amatuk, Lower Potaro River	Eigenmann
1011 C.	1	65	Tumatumari, Lower Potaro River	Eigenmann

Very similar to *M. oligolepis* but without trace of caudal spot and with the anal falcate.

Head 3.75-4; depth 2.3-2.6; D. 11; A. 23 or 24; scales 5-30 to 34-3. Eye 2.4-2.5; interorbital 2.8-3.

Compressed, elevate; the dorsal profile high, angulated at the origin of the dorsal; profile depressed over the eye; ventral profile regularly arched from the snout to the end of the anal. Predorsal area narrowly rounded, with a median series of eight to ten scales; preventral area bluntly keeled, with a median series of scales; postventral area narrowly rounded, with a series of saddle-shaped median scales.

Occipital process four in the distance from its base to the dorsal, bordered by three scales on the side; head narrow, interorbital convex, smooth; fontanels of equal width, the posterior considerably longer, continued as a groove to the tip of the process. Second suborbital, striate, leaving a considerable naked area. Maxillary 2.6 in the head. Usually five teeth in the front row of the premaxillary, the third tooth withdrawn from the line of the rest; five graduated teeth in the inner series; the mandible with four large graduate teeth in the front and small ones on the sides. Three small teeth in the maxillary.

Scales regularly and deeply imbricate, without interpolated rows; each scale with numerous radiating striae; lateral line sagging to below the middle of the dorsal; anal sheath of a single series of scales along the first twelve rays; caudal lobes scaled for half their length.

Origin of dorsal in advance of the middle of the body, its longest ray two and a half as long as the penultimate, three and a third in the length; caudal lobes equal, a little longer than the longest dorsal ray; anal emarginate, its longest



ray when depressed reaching the base of the last but four anal ray; ventrals reaching anal, pectorals about one scale beyond origin of ventrals.

No caudal spot, a large horizontally oval humeral spot continued below to the origin of the pectoral; a dark band from origin of dorsal obliquely downward and forward to the lateral line; a dark median lateral line; white below, dark along back, each scale of the side with a conspicuous dark crescent along its middle.

In life all fins but the adipose strongly tinged with red; middle of adipose yellow.

#### 16. MOENKHAUSIA MEGALOPS Eigenmann.

Plate 7, fig. 2.

*Tetragonopterus grandisquamis* ULREY (*non* Müller & Troschel), Ann. N. Y. acad. sci., 1895, 8, p. 281 (Itaituba).

*Astyanax megalops* EIGENMANN, Proc. U. S. N. M., 1907, 33, p. 29 (Itaituba, Brazil).

*Moenkhausia megalops* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438; Mem. Carnegie mus. 1912, 6, p. 325 (Rockstone).

HABITAT.—Amazon and Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5192 Type	1	42 <sup>1</sup>	Itaituba	Agassiz
20723	1	50 <sup>1</sup>	Gurupa	Agassiz
2488 C.	1	56	Rockstone, Essequibo River	Eigenmann
3724 C.	1	65	Santarem, in Rio Tapajos	Haseman

Allied to *M. grandisquamis* with different proportions and different striae, with larger eye.

Head 3.6–3.7; depth 2.5–2.66; D. 9–11; A. 28–30; scales 5–34–3 or 4. Eye 2–2.2 in head, twice as long as snout; interorbital 2.8–3 in the head.

Elongate, compressed, dorsal and ventral profile evenly curved, a slight depression over eye; preventral region with a median series of flat scales bordered by a series of scales angularly bent; postventral region compressed, with a median series of large, thin scales, bordered on each side by slightly asymmetrical scales; predorsal region compressed, the median series of eight scales extending from the dorsal to the occipital crest which is contained three to three and a

<sup>1</sup> To base of caudal.

half times in the distance of its base from the dorsal, and bordered by three scales on each side.

Groove of the occipital frontanel reaching to tip of occipital process; inter-orbital slightly convex; second suborbital leaving a narrow naked margin of the cheeks; maxillary not reaching to the end of the first suborbital two and three fourths in the head, equal to the distance of the tip of the snout from the pupil. Four teeth in the front row of the premaxillary, the third slightly withdrawn from the line of the others, five graduated teeth in the inner series; maxillary with three teeth; mandible with four teeth and numerous small ones on the side.

Gill-rakers 9 + 14.

Scales deeply imbricate, each with several divergent striae. Anal sheath of a single series of scales. Lateral line but little descending. A well-developed axillary scale; caudal scales caducous.

Origin of dorsal in front of middle of body; ventrals nearer tip of snout than the dorsal, equidistant from tip of snout and base of last anal ray or a little nearer the former; pectorals extending little beyond origin of ventrals; ventrals not quite to anal; anal slightly emarginate.

A vertical humeral spot above the space between the third to the fifth scale of the lateral line, faint; no caudal spot; a broad silvery lateral line. Some metallic reflections.

The specimen from the Essequibo 2488C. is deeper and has a narrower second suborbital than the type.

# 17. MOENKHAUSIA SHIDELERI, Eigenmann.

Plate 12, fig. 1.

*Moenkhausia shideleri* EIGENMANN, Annals Carnegie mus., 1909, 6, p. 15 (Bartica); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438; Mem. Carnegie mus., 1912, 5, p. 325, pl. 47, fig. 4.

HABITAT.—Essequibo River.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1012 C. Type	1	65	Bartica	Shideler
11716 I. Cotype	1	73	Bartica	Shideler

Head, 3.7–3.8; depth 2.5–2.7; D. 10; A. 26; scales 5–34–3 or 4. Eye 2.1; interorbital 2.4 or 2.5.

Elongate, subrhomboidal, the ventral surface in front of the anal distinctly arched; a very slight depression over the eye; preventral area rounded, a series of median scales; postventral region narrowly rounded, with a median series of large scales, bordered by slightly asymmetrical scales. Predorsal area keeled to near the occipital crest. A median series of scales between the dorsal and occipital crest whose length is about one fifth of the distance from its base to the dorsal.

Interorbital slightly convex; second suborbital leaving a narrow naked border on the cheek. Maxillary three in the head; four or five teeth in the front row of the premaxillary, the third somewhat removed from the rest; five graduated teeth on the inner row; two small teeth on the maxillary; mandible with four large teeth and numerous small ones on the side.

Gill-rakers about 9 + 12.

Scales regularly and deeply imbricate, each with several divergent striae. Anal sheath of a few scales in a single row near front of anal; lateral line but little decurved; caudal scaled for about one fourth of its length.

Origin of dorsal in front of middle of body, but little more remote from snout than dorsal; highest dorsal ray about two and two thirds in the length; caudal deeply forked, the lobes longer than the dorsal; anal deeply emarginate; ventrals not reaching anal, pectorals just to ventrals.

No humeral spot; caudal with a small diffuse dark spot at the base of the middle rays. Scales of sides margined with dark, the marginal spots tending to form lines along the sides; pigment more profuse toward the back; a series of dark spots on the median series of scales of the back.

#### 18. MOENKHAUSIA COSTAE (Steindachner).

Plate 14, fig. 2; Plate 100, fig. 2.

*Tetragonopterus costae* STEINDACHNER, Anz. K. akad. wiss. Wien, 1907, p. 83 (Rio San Francisco; Rio Grande do Norte; Rio Preto).

HABITAT.—Rio San Francisco; Rio Itapicuru.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3713 C.	19	57-64	Joazeiro	Haseman
3714 C.	51	largest 59	Pirapora	Haseman
3715 C.	76	largest 61	Lagoa Pereira	Haseman
3716 C.	1	69	Lagoa de Porto	Haseman
3717 C.	26	48-60	Barreiras, Lagoas of Rio Grande	Haseman
3718 C.	18	36-57	Boqueirao	Haseman
3719 C.	31	35-58	Santa Rita	Haseman
3720 C.	37	35-56	Queimadas, Rio Itapicurú	Haseman
3721 C.	44	40-70	Penedo	Haseman
3722 C.	16	11 <sup>1</sup> -48	Penedo	Haseman

Head 4; depth 2.25-3.25; D. 11; A. 26-28; scales 5-32 to 34-3.5. Eye 2.6 in the head; interorbital equal to the eye or a little narrower.

Much compressed, the depth varying greatly; dorsal and ventral outline regularly and nearly equally arched; area immediately in front of ventrals flat, region between the pectorals bluntly keeled, about fourteen scales in the median series in front of the ventrals; predorsal area bluntly keeled, with a median series of ten scales.

Occipital process about one fifth of the distance from its base to the dorsal, bordered by three scales on each side; interorbital convex; frontal fontanel distinctly shorter than the parietal without its groove.

Third suborbital covering the entire cheek, leaving but a small naked triangle under its anterior corner; mouth small, the antero-posterior extent of the premaxillary very small, maxillary large, about as long as the eye, its anterior margin convex; the mouth similar to that of *M. dichrourus*. Teeth all feeble, each ramus of the mandible with five or six graduate teeth, of which the second is more forward, out of line with the rest, forming an incipient second series, sides of the ramus with about seven to ten minute conical teeth; premaxillary with three to five teeth in the outer row, five in the inner; maxillary with or without a microscopic conical tooth.

Gill-rakers slender, about equal to the snout in length, 11 + 14. Scales thin, entire, with widely diverging radia; no interpolated scales; anal with a feeble sheath of one series of scales in its front half; caudal lobes densely scaled to near the tip, the central rays nearly naked.

Dorsal pointed, the first rays about three and a half in the length; anal

<sup>1</sup>Specimens only fifteen mm. long have the characteristic coloration.

emarginate, its origin behind the vertical from the base of the last dorsal ray; ventrals reaching anal, pectorals about one scale beyond base of ventrals.

Straw-color in alcohol, a narrow silvery, lateral band; sometimes a faint, always minute, humeral spot; a black stripe along base of anal, along ventral surface of caudal peduncle, then upward and backward along the posterior margin of the upper caudal lobe. This black stripe is diagnostic for the species, although it is at times (Penedo specimens) scarcely perceptible. It is especially conspicuous in the specimens from Queimadas.

#### 19. MOENKHAUSIA DICHROURA (Kner).

Plate 8, fig. 3; Plate 15, fig. 1; Plate 95, fig. 3; Plate 100, fig. 3.

*Tetragonopterus dichrourus* KNER, Characinen, 1859, p. 41, tab. 9, fig. 21 (Rio Guaporé; Caiçara; Paraguay); GÜNTHER, Cat. fishes Brit. mus., 1861, 5, p. 324; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 279; Perugia, Ann. Mus. civ. storia nat. Genova, 1891, ser. 24, 10, p. 45 (Chaco Centrale); BOULENGER, Trans. Zool. soc. Lond., 1896, 14, p. 35 (San Luis and Descalvados); BOULENGER, Boll. Mus. univ. Torino, 1897, 12, no. 279, p. 1 (San Lorenzo); 1900, 15, no. 370, p. 2 (Uruchin); EIGENMANN & KENNEDY, (in part), Proc. Acad. nat. sci., Phil., 1903, p. 522 (Asuncion; Arroyo Trementina).

*Moenkhausia dichrourus* EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 138, pl. 41, fig. 1 (Tuyuyu; Corumba; Asuncion); Rept. Princeton univ. Exped. Patagonia, 1910, 3, p. 438.

*Moenkhausia dichroura* EIGENMANN, Mem. Carnegie mus., 1912, 5, p. 326.

HABITAT.—Guiana south to Bolivia, Paraguay and the Paranagua.

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
3698 C.	5	28-62	Rio Jauru	Haseman
3699 C.	3	44-91	Puerto Suarez	Haseman
3701 C.	5	53-75	San Joaquin, Bolivia	Haseman
3703 C.	2	43-52	San Joaquin	Haseman
3704 C.	2	51-60	Corumba	Haseman
3705 C.	2	56-60	Bastos	Haseman
3706 C.	8	52-66	Asuncion	Haseman
3707 C.	2	62-65	Arequa	Haseman
3708 C.	26	40-66	Villa Hays	Haseman
3709 C.	16	52-67	Lagoa de Paranagua	Haseman
3738 C.	2	58-62	Santarem	Haseman
1345 C., 11861 I.	2	59-62	Warraputa Cataract, Essequibo River	Eigenmann
1346 C.	2	28-65	Crab Falls, Essequibo River	Eigenmann
1347 C., 11862 I.	12	58-63	Konawaruk, Essequibo River	Eigenmann

These specimens are without exception more slender than the types. In shape the types resemble *M. barbouri*, from which they differ in the number of

anal rays. Distinguished by the oblique mouth, feeble dentition, rounded anterior margin of the maxillary, and color of the caudal.

Head about 4; depth usually 3, ranging from 2.75 to 3.5; D. 11; A. 25-28<sup>1</sup>; scales 5 or 5.5-34 to 39<sup>2</sup>-3 or 3.5 (to ventrals). Eye 2.4-2.6 in the head; interorbital slightly less than eye.

Elongate, moderately compressed; dorsal and ventral profiles nearly symmetrical, the ventral profile slightly more convex than the dorsal which is slightly depressed over the head; preventral area rounded with obscure keels on the sides, postventral area very narrowly rounded or keeled; predorsal area keeled, with a median series of about ten scales from the occiput to the dorsal.

Occipital process one fifth the distance from its base to the dorsal, bordered by three scales on the sides; interorbital distinctly and evenly convex; second suborbital variable, leaving a narrow naked area on the cheek; maxillary about three in the head, equal to the distance from the tip of the snout to the pupil, its anterior margin regularly arched; mandible two and a half in the head, very oblique; mouth small, dentition feeble, usually four (3-5) teeth in the front row of the premaxillary, the third removed slightly from the line of the others; five, rarely six teeth in the inner series; maxillary without teeth or with one, rarely two, feeble ones; lower jaw with four larger teeth and several minute ones on the sides, the mouth is much smaller (narrower) and the dentition much feebler than in *M. lepidura* of the same size.

Gill-rakers long and slender, much longer than *M. lepidura*, about 11 + 16, those of the upper arch similar to but shorter than those of the lower, the longest one third to half the length of eye.

Scales nearly semicircular, deeply imbricate, with several diverging striae<sup>3</sup>; anal sheath of a single series of scales; caudal lobes scaled for two thirds of their length; a well-developed axillary scale.

Dorsal about equidistant from tip of snout and base of caudal, its height three and a half in the length; ventrals nearer tip of snout than the dorsal, about equidistant from tip of snout and end of anal; origin of anal behind

<sup>1</sup> In twenty specimens from the Amazon Basin, six have twenty-five, seven twenty-six, five twenty-seven, and two twenty-eight rays.

<sup>2</sup> In sixteen specimens from the Amazon Basin one has thirty-four, two have thirty-five, seven thirty-six, and six thirty-seven pores in the lateral line. A specimen from Paraguay has thirty-nine; of fifteen specimens from the Essequibo, six have thirty-six, eight thirty-seven, and one has thirty-nine.

<sup>3</sup> The striae usually start from about the same vertical line and diverge backward, one specimen from Villa Bella (20711) and two from José-Fernandez (21006) differ from the rest. The condition approaches that of *M. grandisquamis*. Successive pairs of striae are joined at the base and follow each other like a series of stacked v's placed horizontally. The specimen from José-Fernandez have the depth 2.75 in the length.

the vertical from the last dorsal ray; ventrals not reaching anal, pectorals to ventrals.

A well-defined, silvery, lateral band, half as wide as the eye along the middle of the sides, tapering from below the dorsal forward; middle caudal rays black, caudal lobes beyond the tips of the middle rays black, the tips milk-white. The intensity of the caudal color differs very much with the condition of the specimens, the method of preservation, and the locality; an insignificant humeral spot not evident in alcoholic specimens.

The silvery lateral band of the sides is underlaid with a black band of the same size and shape. In formaline specimens in which the silvery band is dissolved a black band takes its place. Base of caudal lobes in life bright yellow, dorsal and adipose yellowish.

Vertebrae 13 + 18.

Posterior air-bladder sausage-shaped, its diameter about equal to that of eye, its length twice that of the anterior section, bent down somewhat to near the origin of the anal.

Alimentary canal less than the total length with the caudal.

## 20. MOENKHAUSIA INTERMEDIA Eigenmann.

Plate 15, fig. 2; Plate 101, fig. 8, 9.

*Moenkhausia dichrourus intermedius* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 103 (Tabatinga); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438.

*Moenkhausia lepidura madeirae* FOWLER, Proc. Acad. nat. sci. Phila., 1913, p. 540, fig. 11 (Tributary of Rio Madeira near Porto Velho).

HABITAT.—Amazon, Paraguay, and Paraná Basins.

### *Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
20762 Cotypes	2	42-64	Tabatinga	Bourget
3709 C.	4	25-43	San Louiz de Caceres	Haseman
3700 C.	1	47	Rio Santa Rita, near frontier of Bolivia	Haseman
3702 C.	2	60-67	Salto Avanhandava	Haseman

Closely resembling *M. dichroura* from which it differs mostly in the shape of the open mouth.

Head 4+; depth 3+; D .11; A. 25; scales 5-35-3.5. Eye 2.25-2.75; inter-orbital 3 in the head.

Slender, dorsal and ventral profiles regular; preventral area flat, with a median series of twelve scales; predorsal area rounded, with a median series of ten scales; occipital process about one fifth of the distance from its base to the dorsal; interorbital very little arched; second suborbital nearly covering the entire cheek in the largest, with a wider naked border in the smaller; maxillary about one third of the length of the head; its anterior margin not as greatly arched as in *M. dichrourea*. Premaxillary with three or four teeth in the anterior series, five in the inner series; dentary with four large teeth, the anterior two not in a continuous series with the posterior two in the larger specimens, the third tooth being farther in. Gill-rakers one fourth to four tenths the length of the eye.

Origin of dorsal in middle of the body; origin of ventrals further forward; pectorals reaching the ventrals, ventrals to anal. Scales with up to eight divergent striae.

A silvery lateral band, middle caudal rays and tips of the lobes or a submarginal band black.

The specimens described by Fowler are more slender than the others.

## 21. MOENKHAUSIA LEPIDURA LEPIDURA (Kner).

### Plate 8, fig. 2.

*Tetragonopterus lepidurus* KNER, Characinen, 1859, p. 40, tab. 8, fig. 20 (Rio Guaporé); Günther, Cat. fishes Brit. mus., 1864, **5**, 328; STEINDACHNER, Flussf. Südam., 1882, **4**, p. 32 (Tabatinga; Cudajas; Obidos; Villa Bella); EIGENMANN & EIGENMANN, Proc. U. S. Nat. Mus., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 278; VAILLANT, Bull. Mus. d'hist. nat., 1899, p. 155 (Carnot). *Moenkhausia lepidurus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, **3**, 1910, p. 438. *Moenkhausia lepidura* EIGENMANN, Mem. Carnegie mus., 1912, **5**, p. 326.

HABITAT.—Amazons Basin and north to Guiana.

The types in the Vienna Museum have the depth three and one half in the length. Aside from the types I have examined the following:

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
20954	5	63 to about 90	Jatuarana	Navez
20743	4	70-85	Tajapurú	Agassiz
21062	12	68-80	Arary	Thayer
20722	1	90	Gurupa	Agassiz
20790, 20788, 20778	34	63-84	Santarem	Bourget



Catalogue number	Number of specimens	Length in mm.	Locality	Collector
20965, 20863, 20864	7	45-81	Rio Tapajos	Dexter, James, and Talisman
20849	2	88	Obidos	Bentos
Part of 20829	2	about 40 to about 50	Obidos	James
20712	3	about 70	Villa Bella	Agassiz
21019	1	about 75	Ueranduba	Coutinho
20992	7	about 60 to about 80	Serpa	Thayer
21010	1	85		Justa
20730, 20733	6	54-72	Lake Hyamary	Agassiz
20735	12	about 55-73	Lago Maximo	Agassiz
20701, 20702, 20703 <sup>1</sup>	33	49-85	Teffé	Agassiz
20744	1	about 76	Toeantins	Agassiz
20853, 20857	3	45-60	Jutahy	James, Thayer, and Talisman
3733 C.	1	68	Cachoele de Riberão, Rio Madeira	Haseman
3731 C.	7	44 to about 89	Maciel, Rio Guaporé	Haseman
3732 C.	3	67-77	Bastos	Haseman
1335 C., 11825 I.	203	54-75	Bartica, Essequibo River	Shideler
1336 C., 11826 I.	12	47-71	Rockstone, Essequibo River	Eigenmann
1337 C., 11827 I.	8	42-56	Gluck Isl., Essequibo River	Eigenmann
1338 C., 11828 I.	51	44-80	Crab Falls, Essequibo River	Eigenmann
1339 C., 11829 I.	22	45-58	Konawaruk, Essequibo River	Eigenmann
1340 C., 11830 I.	7	45-82	Warraputa, Essequibo River	Eigenmann
1341 C., 11831 I.	215	42-95	Tumatumari, Potaro River	Eigenmann
1342 C., 11832 I.	20	45-94	Creek below Potaro Landing	Shideler
1343 C., 11833 I.	4	51-61	Erukin, Potaro below Amatuk	Eigenmann
1344 C., 11834 I.	4	62-108	Malali, Demerara River	Shideler

The species is very variable in shape, number of anal rays and scales. It is distinguished by the peculiar coloration of the upper half of the caudal.

Head 3.75-4.4; depth 3<sup>2</sup>-3.5; D. 11; A. most often 24, ranging from 22-27<sup>3</sup>; scales 5-35-4<sup>4</sup>. Eye 2.5-3, about equal to the interorbital.

Elongate, moderately compressed, greatest depth under origin of dorsal, the dorsal and ventral profiles evenly curved, or the ventral profile more arched, or preventral area broadly rounded; postventral area very narrowly rounded.

<sup>1</sup> In part.

<sup>2</sup> In some of the specimens (20788) from Santarem, and some of those from Guiana, the depth is much greater, 2.75 in the length.

<sup>3</sup> Of fifty-five specimens six have twenty-two anal rays, sixteen twenty-three, twenty-one, twenty-four, seven twenty-five, two twenty-six, and three twenty-seven.

<sup>4</sup> In one case there were found six scales above the lateral line, in two cases five and one half. The scales along the lateral line average thirty-five, but range from thirty-one to thirty-seven. In twenty-four one has thirty-one scales, five thirty-four, eleven thirty-five, five thirty-six, and two thirty-seven.

Predorsal area obscurely keeled, a median series of scales may extend from the dorsal to the occipital process or a variable number of the median scales near the occipital process may be divided into two halves, leaving a naked line continued from the occipital process; the median series of scales thus varies from six to nine.

Occipital process moderate, four or five times in the distance from its base to the dorsal, bordered by three scales on the side. Interorbital convex; second suborbital covering a variable amount of the cheeks but always leaving a comparatively broad naked border even in the large specimens (20722); maxillary not reaching to the end of the first suborbital, equal to the length of the snout or a little more. Premaxillary usually with four teeth in the front series, the second tooth withdrawn from the line; rarely three or five teeth (in one case six) in the front row, second row with five graduated teeth; maxillary usually with one, rarely with two teeth; lower jaw with four, large graduated teeth on each side and a number of smaller ones.

Gill-rakers very small, about  $6 + 9$ , longest about four in the diameter of the eye.

Scales regularly imbricate, thin, those on the sides with two to ten striae. Anal naked, or its sheath composed of a single series of scales; caudal lobes scaled for at least half their length; lateral line very slightly decurved; four scales between the origin of the anal and the lateral line; axillary scale well developed.

Origin of dorsal little nearer tip of snout than base of caudal; origin of ventrals scarcely nearer tip of snout than the dorsal; highest dorsal ray three and a half in the length; anal emarginate, its origin below the first or second scale behind the dorsal; ventrals about reaching anal or but little beyond anus, pectorals nearly or quite to ventrals.

Upper half of caudal, except a semicircular spot at the upper part of its base, black of varying intensity, sometimes shading into light at the upper margin and with the tip light; lower half of the caudal hyaline or dusky toward the tip (20730) shading into the black of the upper lobe at the middle; a small, horizontally oval, or round humeral spot over the second and third scales of the lateral line; a silvery lateral band one fourth the diameter of the eye in width, bordered above by dusky; iridescent steel-blue above, brassy below. In the young the caudal markings are very faint.

In living specimens from Guiana the base of the upper caudal lobe is conspicuously yellow or orange or cherry, base of lower caudal lobe, adipose, dorsal

rays and anal lobe less intensely yellow or orange. The black of the caudal is most variable, darkest near the orange spot or nearer the tip, the part of one color shading gradually into that of the other or with an abrupt broken dividing line or "water marked."

Vertebrate 14+17.

Posterior air-bladder of nearly equal width throughout, its width equal to the diameter of the eye, its length nearly twice that of the anterior section; alimentary canal not quite equal to the entire length.

## 22. MOENKHAUSIA LEPIDURA LATA Eigenmann.

Plate 101, fig. 10.

*Moenkhausia lepidurus latus* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 103 (Rio Tapajos); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438.

20860 Cotypes      27      55-75 mm.      Rio Tapajos.      Dexter, James, and Talisman.

These specimens differ from others from the Tapajos and from various other localities. The anal rays average 26+; five specimens have twenty-five, eleven twenty-six, eight twenty-seven, and four twenty-eight rays. The body is deeper, the depth averaging 2.6 of the length; the scales in the lateral line vary from 32 to 34, being most frequently 33.

The middle caudal rays are but faintly colored if at all, but the upper caudal lobe is black.

## 23. MOENKHAUSIA LEPIDURA ICAE Eigenmann.

Plate 101, fig. 6.

*Moenkhausia lepidurus icæ* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 103 (Iça); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438.

HABITAT.—Iça.

20810, 20812 Cotypes      46      30-50 mm.      Iça      James

Deep, compressed fishes, depth three in the length; anal rays usually twenty-three or twenty-four; two have twenty-one, six twenty-two, ten twenty-three, thirteen twenty-four, and one has twenty-five rays; the scales in the

lateral line number with about equal frequency, thirty-one, thirty-two, or thirty-three.

Pectorals just reaching ventrals.

Upper caudal lobes and sometimes the distal part of the other rays dusky, a very small but well-defined humeral spot of about ten chromatophores over the fourth or fifth scale of the lateral line; tip of anal lobe sometimes milk-white.

24. *MOENKHAUSIA LEPIDURA HASEMANI*, subsp. nov.

Plate 15, fig. 3; Plate 101, fig. 5.

3746 Type                      45 mm. to base of caudal                      Santarem, Dec. 12, 1909                      Haseman

Head 4+; depth 3.4; D .11; A .24; scales 5-37-3.5. Eye 2.66 in the head, snout 3.33; interorbital 2.66.

Slender, dorsal and ventral profiles gently and evenly curved, preventral area flattish with a median series of thirteen scales; predorsal area rounded with a median series of ten scales. Occipital process one fifth as long as the distance from its base to its dorsal, bordered by three scales. Interorbital rounded, maxillary a little less than one third of the length of the head, its anterior margin greatly arched forward, less so posteriorly. Second suborbital leaving a naked border all around. Three or four teeth in the anterior row of the premaxillary, a small tooth on the maxillary; dentary with four large teeth and abruptly small ones on the sides.

Origin of dorsal midway between tip of snout and base of middle caudal rays; pectorals not reaching the ventrals whose origin is in advance of the vertical from the origin of the dorsal; anal slightly falcate.

Scales firm with up to ten prominent radiae. Anal sheath very feeble, axillary scale well developed.

A faint humeral spot on and above the third and fourth pores of the lateral line. A silvery lateral band, most prominent between the dorsals and ending a few scales in advance of the lateral line. No caudal spot.



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25. *MOENKHAUSIA LEPIDURA GRACILIMA* Eigenmann.

Plate 101, fig. 7.

*Moenkhausia lepidurus gracilimus* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 104 (Serpa); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438.

HABITAT.—Serpa.

20983 Cotypes      21      About 39–57 mm.      Serpa      Thayer

Anal on an average with twenty-two rays, there being one with nineteen, two with twenty, one with twenty-one, eleven with twenty-two, four with twenty-three, one each with twenty-four and twenty-five; pectoral not reaching ventrals.

Depth 4 or nearly 4, the greatest depth just behind pectorals, then tapering gradually to caudal. The fontanel, in the long, slender ones with a typically colored caudal, is narrower than in the others. Lateral line 35 or 36.

Color of caudal as in typical individuals of *M. lepidura*, but faint, with a dusky shade extending on the lower caudal lobe.

Humeral spot, even in the smallest, of over twenty chromatophores, not well defined.

20717      17      47–59 mm.      Villa Bella      Agassiz

These specimens are nearest those from Serpa. They have, on an average, twenty-two anal rays. Five have twenty-one, five twenty-two, and four twenty-three; the pectoral does not reach the ventrals. Depth 3–4; lateral line 35 or 36. Middle caudal rays and distal part of all the remaining rays as well as the upper and lower margin of the fin dusky; tip of anal lobe sometimes milk-white; humeral spot of many chromatophores, extending up from the second and third or third and fourth scales.

These specimens are appreciably different from typical *M. lepidura gracilima*, but gradations between them are almost perfect.

26. *MOENKHAUSIA COLLETTII* (Steindachner).

Plate 8, fig. 1; Plate 15, fig. 4; Plate 101, fig. 3.

*Tetragonopterus collettii* STEINDACHNER, Flussf. Südamer., 1882, **4**, p. 33, pl. 7, fig. 3, (Obidos; Hyavary); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 81

*Moenkhausia collettii* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438; Mem. Carnegie mus., 1912, **5**, p. 328.

HABITAT. — Amazons and Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20952	36	37-63	Jatuarana	Navez
20711, 20721	20	20-59	Villa Bella	Agassiz
20812	3	37-49	Iça	James
20840	3	31-40	?	?
20843	41	about 34-54	Obidos	Bentos
1324 C. 11804 I.	19	43-58	Wismar, Demerara River	Eigenmann
1326 C. 11807 I.	5	34-39	Malali, Demerara River	Shideler
1327 C. 11810 I.	136	40-61	Rockstone, Essequibo River	Eigenmann
1328 C. 11806 I.	12	37-59	Gluck Island at Rockstone	Eigenmann
1329 C. 11808 I.	5	41-56	Crab Falls, Essequibo River	Eigenmann
1330 C. 11803 I.	19	33-46	Konawaruk, Essequibo River	Eigenmann
1331 C. 11809 I.	41	35-66	Tumatumari, Potaro River	Eigenmann
1332 C. 11801 I.	100+	24-68	Erukin, tributary of Potaro River, below Amatuk	Eigenmann
1333 C.	1	63	Amatuk Cataract	Eigenmann
1334 C.	3	38-40	Tusaca Pan, Rupununi	Grant
3739 C.	111	largest 58	Bragança	Haseman
3740 C.	16	45-50	Bastos	Haseman
3741 C.	2	53-56	Manaos	Haseman
3742 C.	5	40-56	Maciel, Rio Guaporé	Haseman

Head 3.7-3.8; depth 2.6 in gravid females to 3.3 in males, 3.75 in some specimens from Guiana; D. 11 (rarely 10 or 12); A. usually 33 or 34<sup>1</sup>; scales 5-34<sup>2</sup>-3½; eye 2.5-2.75; interorbital about 3 in head.

Compressed, dorsal and ventral profiles equally curved, without humps or depressions; preventral area rounded; postventral area compressed or narrowly rounded; predorsal area keeled for at least half the distance from the dorsal to the occipital process; a median series of nine or ten predorsal scales extending from the dorsal to the occipital.

Occipital process extending about one fifth of the distance from its base to the dorsal, bordered by two or three scales; interorbital convex in the middle, with lateral grooves; frontal fontanel narrower and about three fourths as long as the parietal; second suborbital leaving a naked area on the cheek, widest

<sup>1</sup> Of the Amazon valley specimens one has nineteen anal rays, three have twenty, five twenty-one, six twenty-two, thirty-four, twenty-three, twenty-eight, twenty-four, eleven twenty-five, and five twenty-six. Of forty-one Guiana specimens three have twenty-one anal rays, sixteen twenty-two, sixteen twenty-three, and six twenty-four.

<sup>2</sup> Rarely 33 and 35.

below; maxillary equal to distance from tip of snout to pupil, three in the head. Usually four, sometimes five teeth in the outer row of the premaxillary, the second and third close together, the third withdrawn from the line; five teeth in the second series; maxillary with two or three minute teeth.

Four large teeth in the front of the lower jaw, minute ones on the sides.

Gill-rakers  $7 + 10$ , about one third the diameter of the eye.

Scales closely imbricate, with several striae; caudal lobes scaled for rather more than half their length; anal with a sheath of a single series of scales in front; lateral line but little decurrent, the rows of scales above and below it parallel with it; a well-developed axillary scale.

Origin of dorsal usually nearer tip of snout than base of caudal, its height three and a half in the length, its highest ray nearly three times as high as its penultimate; caudal widely forked, the lobes longer than the height of the dorsal; anal emarginate, its highest ray reaching to base of last ray but five, its origin considerably behind the vertical from the last dorsal ray, its base about three and a half in the length; pectorals reaching ventrals, ventrals to or nearly to anal; origin of the ventrals equidistant from tip of snout and base of last anal ray.

No caudal spot; a very narrow silvery band overlying a dark line; a well-defined humeral spot of numerous chromatophores above the third, fourth, and fifth scales of the lateral line; numerous chromatophores on the upper half of the cheek and opercle; a dark line of varying intensity and width along the base of the anal; scales of the back margined with dusky; scales of the median line in front of and behind the dorsal dusky, or with a dusky margin and a dusky median spot. The color varies much in intensity with different localities. Those from Jatuarana, Villa Bella, Iça are pale, those from Obidos are dark. In life the vertical fins of the Guiana specimens at least are more or less tinged with red.

Anterior anal rays of the male with recurved hooklets.

Vertebrae  $13 + 17$ .

Posterior air-bladder about equal to the eye in diameter, more than twice the length of the anterior bladder, about three times as long as the eye, blunt behind and bent down to near the origin of the anal. Alimentary canal about equal to the length without the caudal. Insect eaters.

There is considerable variation in shape in the Guiana specimens enumerated. The specimens from Rockstone are deep and thin, depth about 2.75; those from Konawaruk and the Potaro are more elongate and heavier. In the Konawaruk specimens the depth is 3.75.

27. *MOENKHAUSIA COPEI* (Steindachner).

Plate 9, fig. 3; Plate 101, fig. 4.

*Tetragonopterus copei* STEINDACHNER, Flussf. Süd-am., 1882, 4, p. 135, pl. 6, fig. 6, (Santarem); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53.

*Moenkhausia copei* EIGENMANN, Rept. Princeton univ. Exped. Patagonia, 1910, 3, p. 438; Mem. Carnegie mus., 1912, 5, p. 329.

HABITAT.—Santarem to Para and British Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20783	30	34-44	Santarem	Bourget
21072	1	30 (to base of caudal)	Para	Thayer Expedition
1321 C. 11824 I.	26	30-56	Wismar, Demerara River	Eigenmann
1322 C. 11821 I.	11	33-56	Gluck Island at Rockstone	Eigenmann
1323 C. 11820 I.	53	27-55	Rockstone, Essequibo River	Eigenmann
1324 C. 11823 I.	42	35-45	Tusaca Pan, Rupununi	Grant
3742 C.	5	40-56	Maciel, Rio Guaporé	Haseman

Closely allied to *M. collettii*; distinguished by the shorter anal.

Head 3.66-4; depth 3.33-3.66; D. 11; A. 18-20<sup>1</sup>; scales 5-32 to 34-3.5 (usually 33 pores in the lateral line). Eye 2.5-2.75 in the head; interorbital 3 or a little more.

Slender, little elevated; dorsal and ventral profiles about equally curved, nowhere notably depressed or elevated; preventral area flattish; postventral area compressed; predorsal area obscurely keeled just in front of the dorsal, with a median series of nine scales reaching to the occipital process.

Occipital process short, less than one fifth the distance from its base to the dorsal, bordered by two or three scales on the side; interorbital convex in the center, with lateral grooves; frontal frontanel much narrower and about three fourths as long as the posterior; second suborbital leaving a naked border on the cheek which is widest below; maxillary equals distance from tip of snout to pupil; frequently four teeth in the outer row of the premaxillary, of which the middle two are close together and remote from the others; five teeth in the second row; one or two maxillary teeth; four large teeth in the front of the mandible.

<sup>1</sup> Out of fourteen four have eighteen anal rays, nine nineteen and one twenty.

Gill-rakers one fifth to two sevenths of the diameter of the orbit, about 7 + 12.

Scales closely imbricate, with few divergent striae; caudal lobes scaled for about half their length; anal with a sheath of a single row of scales in front; lateral line but little decurved, the rows of scales above and below it parallel with it; a well-developed axillary scale.

Origin of dorsal about equidistant from tip of snout and base of caudal, its height three and a half in the length; caudal deeply forked, the lobes about three in the length; anal deeply emarginate, its origin behind the vertical from the last dorsal ray; pectorals and ventrals about the same length, about equal to the length of the head without the snout; ventrals not to anal, tips of pectorals one or two scales from ventrals.

No caudal spot; a very narrow silvery band overlying a narrow dark band which in some specimens becomes wider in front, sometimes expanded into a humeral spot over the fourth scale of the lateral line, continued across the upper part of the opercle and preopercle to the eye; a black line along the base of the anal, expanded into a broader spot above the base and in front of the first anal rays; middle anal rays dark; scales of the back margined with dusky, scales of the median line in front of the dorsal dark.

The Rockstone specimens have the caudal rose colored in life, especially the upper lobe; those from Gluck Island have the adipose and upper caudal lobe rusty, anal lobe lemon-yellow, dorsal yellow in center, tinged with orange.

Vertebrae 12 + 17.

Posterior air-bladder long, banana-shaped; curved down behind to in front of the anal, its diameter but little less than that of the eye, its length at least twice that of the anterior air-bladder. Alimentary canal about equal to the length (without the caudal).

## 28. MOENKHAUSIA CEROS Eigenmann.

Plate 9, fig. 2; Plate 101, fig. 1.

*Moenkhausia ceros* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 104 (Lake Hymanu); Rept. Princeton univ. expd. Patagonia, 1910, 3, p. 438.

HABITAT.—Amazon Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20955 Type	1	50	Lake Hyanuary	Navez
3725 C.	1	52	Manaos	Haseman
3726 C.	3	about 20-51	Bastos	Haseman

Distinguished by its caudal spot and short anal. Head 4; depth 3.25; D. 11; A. 18 or 19; scales 5-33 or 34-3. Eye 3, a little more than interorbital.

Elongate, compressed; dorsal and ventral profiles gently curved, dorsal profile somewhat angulated at the origin of the dorsal, not depressed over eyes. Preventral area flattish, with a median series of scales, the lateral scales somewhat angulated; predorsal area somewhat keeled, with a median series of ten scales reaching from the occipital process to the dorsal.

Occipital process short, reaching about one sixth to dorsal, bordered by three scales on each side; interorbital very slightly convex; second suborbital leaving a wide naked area; maxillary not reaching end of first suborbital, equal to distance from tip of snout to pupil, two and two thirds in the head.

Four teeth in the front series of the premaxillary, opposite the second and third of the inner series, the first distinctly largest; inner series of five or six graduated teeth; four large, graduated teeth on each ramus of the lower jaw and numerous small ones.

Gill-rakers about 9 + 15, long and slender, one half as long as eye.

Scales regularly imbricate, with four to six striae; two and a half scales between lateral line and front of anal, apparently no anal sheath; caudal lobes with scales for at least half their length; lateral line slightly decurved, the rows of scales above and below it parallel with it; a well-developed axillary scale.

Origin of dorsal about equidistant from tip of snout and base of caudal, the ventrals a little nearer tip of snout; highest dorsal ray not quite four in the length; anal emarginate, its origin but little more remote from the tip of the snout than the end of the dorsal, anal basis a little more than one fourth of the length; the adipose fin opposite the end of the anal. Ventrals reaching anal; pectorals to ventrals.

The middle of the first fully developed anal ray of the male provided with a large retrorse hook on each side.

A faint, ill-defined, silvery band, above which is a gray line; middle caudal rays jet black, the color spreading out over the base of the fin. Scales and fins minutely punctate; sides brassy iridescent. Humeral spot very faint or absent.



## 29. MOENKHAUSIA COTINHO Eigenmann.

Plate 9, fig. 1; Plate 101, fig. 2.

*Moenkhausia cotinho* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 104 (Para); Rept. Princeton univ. exped. Patagonia, 1910, **3**, 434; Mem. Carnegie mus., 1912, **5**, p. 327.

HABITAT.—Amazon Basin; Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
21013 Cotypes	2	46-54 (to base of caudal)	?	Justa
21070 Cotypes	3	67-71	Para	Thayer Expedition
3729 C.	3	53-55	Villa Bella	Haseman
3730 C.	2	52-55	Manaos	Haseman
3727 C.	1	52	Maciél, Rio Guaporé	Haseman
3728 C.	1	54	San Joaquin	Haseman
3747 C.	1	48	Santarem	Haseman
1312 C. 11813 I.	35	34-55	Wismar, Demerara River	Eigenmann
1313 C. 11814 I.	33	42-60	Malali, Demerara River	Shideler
1314 C. 11818 I.	22	52-62	Tukeit, Potaro River	Eigenmann
1315 C.	1	64	Cangaruma, Potaro River	Eigenmann
1316 C. 11815 I.	6	45-51	Mud flats below Wismar	Eigenmann
1317 C. 11812 I.	27	44-66	Tumatumari, Potaro River	Eigenmann
1318 C. 11819 I.	17	43-59	Crab Falls, Essequibo River	Eigenmann
1319 C. 11816 I.	7	41-57	Christianburg Canal	Eigenmann
1320 C. 11817 I.	2	35-57	Rockstone, Essequibo River	Eigenmann

Distinguished by its slender form combined with the broad basal caudal bar.

Head 3.7-4; depth 2.8-3.3; D. 11; A. 19-21. Scales 5-31 to 33-3.5. Eye 2.71-3. Interorbital slightly greater or less than eye.

Elongate, not strongly compressed or elevate; dorsal and ventral profiles equally curved, without notable depressions or elevations. Preventral area rounded or flat, with a median series of scales, bordered by scales not at all or but little angulated; postventral area compressed, with a median series of large, angulated scales; predorsal area rounded with a median series of nine scales from the dorsal to the occipital process.

Occipital process short, reaching one sixth the distance to dorsal, bordered by two or three scales on each side. Interorbital slightly convex; second sub-orbital greatly arched, leaving a very narrow naked area; maxillary two and

two thirds to three in the head; three or four teeth in the outer series of the premaxillary, five teeth in the second series; two teeth in the maxillary. Lower jaw with four large teeth followed by a much smaller recurved tooth and a number of minute teeth.

Gill-rakers  $7 + 9$ , very short, the longest about one fifth the diameter of the eye.

Scales very regularly imbricate, of comparatively uniform size, each with about five diverging striae, and with the surface minutely marked as in *M. oligolepis*. Caudal lobes scaled for at least half their length; scales above anal not decreased in size, at most four ( $3\frac{1}{2}$ ) scales between origin of anal and lateral line; anal with a basal sheath of a single series of scales in front, none posteriorly. A well-developed axillary scale.

Dorsal a little nearer base of middle caudal rays than tip of snout, highest dorsal ray three and a half or four in the length; ventrals nearer tip of snout than the dorsal, equidistant from tip of snout and base of lower caudal rays; origin of anal equidistant from tip of snout and the second or third scale behind the dorsal; ventrals scarcely or not reaching anal; pectorals to near ventrals. Anal emarginate.

Brassy, fins dusky. A very large and very conspicuous vertically oval black spot occupying all the base of the caudal (to near the tip of the middle rays), bordered behind, especially on the third, fourth, and fifth rays from the middle, by milk-white.<sup>1</sup>

The three cotypes from Para are much paler, the caudal spot while covering the same area is very faint except that part not covered by the caudal scales.

In all the specimens from the Amazon Basin the lateral line is complete. It is also complete in one hundred specimens from Wismar, Malali, Tukeit, and Cangaruma. The first two of these localities are on the Demerara River, the second two on the Potaro River of British Guiana. Out of six specimens from below Wismar one has the line interrupted.

In at least four out of six specimens from Christianburg, but one mile from Wismar, the lateral line is either interrupted or incomplete.

In the Rockstone specimens it is incomplete.

In the Crab Falls specimen the lateral line is developed on from ten to seventeen scales.

In five specimens from Konawaruk the lateral line is incomplete.

Out of the twenty-seven specimens from Tumatumari the lateral line is

<sup>1</sup> In living specimens from British Guiana this spot is surrounded by rusty.

complete on both sides of two specimens, two have it complete on one side and interrupted on the other. In a number of specimens it is incomplete on one side and interrupted on the other. In five it is interrupted on both sides. In the rest in so far as the specimens are fit for examination it is incomplete.

Lateral line of *Moenkhausia cotinho* from Tumatumari.

Scales with pores in italics.

Left	Right
1, <i>30</i>	<i>30</i>
2, <i>30</i>	<i>31</i>
3, <i>15</i> + 2 + <i>5</i> + 1 + 2 + 1 + 6	<i>31</i>
4, <i>31</i>	<i>23</i> + 4 + 4
5, <i>22</i> + 3 + 1 + 1 + 3	<i>20</i> + 1 + 2 + 1 + 1 + 5 + 3
6, <i>15</i> + 4 + 2 + 11	<i>20</i> + 9 + 3
7, <i>17</i> + 1 + 3 + 11	<i>20</i> + 10 + 2
8, <i>23</i> + 1 + 2 + 5	<i>26</i> + 1 + 2 + 3
9, <i>16</i> + 3 + 1 + 1 + 2 + 5 + 5	<i>16</i> + 4 + 2 + 3 + 4 + 3 + 1
10, <i>21</i> + 11	<i>21</i> + 1 + 2 + 8
11, <i>18</i> + 1 + 2 + 12	<i>23</i> + 10
12, <i>17</i> + 2 + 2 + 11	<i>18</i> + 14
13, <i>16</i> + 16	<i>16</i> + 16
14, <i>14</i> + 17	<i>13</i> + 1 + 1 + 17
15, <i>14</i> + 17	<i>12</i> + 2 + 2 + 15
16, <i>13</i> + 1 + 1 + 18	<i>13</i> + 19
17, <i>13</i> + 17	<i>14</i> + 17
18, <i>14</i> + 18	<i>13</i> + 20
19, <i>11</i> + 20	<i>12</i> + 18

A critical examination of the details given above shows a regular gradation from the completed lateral line of *Moenkhausia* at the top of the list to the incomplete line of *Hemigrammus* at the bottom.

In specimens numbered 3 and 4 in which the line is complete on one side several pores failed of development, not at the end of the line but at some distance from the end. In number 5 the line reaches the caudal on both sides but some pores are missing on both sides. In number 9 we find the same but the missing pores occur four scales further forward. In 6, 7, and 8 the line does not reach the caudal on one side and in all the rest it fails to reach the caudal on both sides. It becomes progressively shorter. Numbers 11, 12, 14, and 15 show that the shortening may take place by the dropping, not of the last pore but of some pores in advance of it.

In this series we see a regular progression without notable breaks from the condition which is considered to characterize one genus to the condition charac-

terizing another genus. This series should be compared with the series of *M. sanctae filomenae*.

To complete the record I add the conditions in the specimens from Konawaruk, Crab Falls, and Christianburg.

Konawaruk is a short distance up the Essequibo from the mouth of the Potaro River, Crab Falls is a still shorter distance below the mouth of the Potaro and Tumatumari a few miles above the mouth of the Potaro at its first cataract.

Lateral line of *Moenkhausia cotinho*.

A. Crab Falls		B. Konawaruk	
Left	Right	Left	Right
17 + 16	16 + 17	14 + 17	12 + 19
16 + 15	10 + ?	13 + 17 + 3	12 + 21
16 + 17	12 + 20	13 + 19	13 + 19
15 + 18	14 + 19	12 + 20	11 + 20
15 + 18	13 + 19	11 + 20	10 + 22
14 + 18	13 + 18		
14 + 19	16 + 16		
14 + 17	13 + 16		
13 + 19	12 + 20		
12 + 20	13 + 18		
12 + 20	12 + 21		
12 + 20	11 + 21		
12 + 20	?		
10 + 22	11 + 21		
		C. Christianburg	
		Left	Right
		15 + 10 + 3	10 + 21
		11 + 21	9 + 23
		? + 21	? + 22
		9 + 24	9 + 23

I have arranged the series from Crab Falls in regard to the pores in the line on the left sides. There is a regular gradation with an approximate but not complete correlation on the two sides of the body.

*Table of Anal Rays and Scales in the Lateral Line.*

[illegible]

4. *KNODUS*, gen. nov.

κνῶ, a trifle, ὀδούς, tooth.

TYPE.—*Bryconamericus breviceps* Eigenmann.

This genus differs from *Moenkhausia* as *Bryconamericus* differs from *Astyanax*.

Second suborbital expanded, in contact with the preopercle below; four teeth in the second row of the premaxillary; caudal scaled at its base; lateral line but little decurved.

HABITAT.—Tapajos, Tocantins, and Paraguay Rivers; Merida, Venezuela.

*Key to the Species.*

- a. Depth 3.5–4.24.
  - b. Dentary with a series of four large teeth, the series continued on the side by graduate teeth. Head 4.25; depth 3.75–4.25; eye 2.75 in head, equals interorbital; maxillary with 2 or 3 teeth; D. 10; A. 18–21, usually 19; scales 5–35 to 38–3; caudal entirely hyaline.
    - 1. *heteresthes* (Eigenmann).
  - bb. Dentary with eight graduate teeth. Head 4; depth 4; eye 3.25 in head; 1.25 in interorbital; maxillary with 3 teeth; D. 10; A. 16; scales 14–33–2. . . . . 2. *meridac* Eigenmann.
  - bb. Dentary with 3 or 3.5 large teeth followed by abruptly smaller teeth on the side; head 4; depth 3.5–3.75; eye 2.5–2.66, equals the interorbital; maxillary with 1–5 (usually 3) teeth; D. 10, A. 22–24; scales 5–39–3.5 or 4; middle caudal rays dark.
    - 3. *moenkhausii* (Eigenmann & Kennedy).
- aa. Depth 3 or less than 3 in the length; dentary with four large graduated teeth and a few smaller, similar ones on the side.
  - c. Head 4.5–4.66; depth 2.66–3; D. 10 or 11; A. 20–23; scales 5.5 or 6–38 to 41–4; eye 3–3.5; maxillary teeth 2 or 3. Caudal with numerous small scales.
    - 4. *breviceps* (Eigenmann).
  - cc. Head 4.25; depth 3 +; D. 10; A. 20; scales 4.5–36–3.5, eye 3; interorbital 2.8; maxillary with three broad teeth; caudal with large scales on the basal third.
    - 5. *victoriac* (Steindachner).
  - ccc. Head 3.75; depth 3; D. 10; A. 20; scales 6–42–4.5; eye 3; maxillary with three teeth.
    - 6. *chapadac* (Fowler).
  - cccc. Head 3.5; depth 3; D. 10; A. 27; scales 5–38–4; interorbital 2.2 in the head; maxillary without teeth. . . . . 7. *jacunda* (Fowler).
  - ccccc. Head 4; depth 2½; D. 9; A. 28; scales 6–39–4; interorbital 2.4 in the head; maxillary without teeth. . . . . 8. *smithi* (Fowler).

1. *KNODUS HETERESTHES* (Eigenmann).

## Plate 10, fig. 4.

*Bryconamericus heteresthes* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 105 (Tapajos); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Tapajos.

Forty specimens, 20862 Cotypes      27–51 mm.      Tapajos      Dexter, James, Talisman

This is the most slender of the species of the genus.

Head 4.25; depth 3.75–4.24; D. 10 (counting everything). A. most often 19<sup>1</sup>, scales 5–35 to 38–3<sup>2</sup>; eye 2.75 in the head, equal to the interorbital.

Slender, elongated, very little compressed, the width being about half the depth; head blunt, the dorsal and ventral profiles equally arched, without depressions or humps; preventral area rounded; postventral area compressed, very narrowly rounded; predorsal area rounded, without trace of a keel, with a median series of 9–11 scales between the dorsal and occipital process.

Occipital process very short, about one eighth of the distance from its base to the dorsal, bordered by two scales on the sides; frontal fontanel less than one third as long as the parietal; interorbital flattish; second suborbital covering the entire cheek, leaving no naked portion; mouth small, the lower jaw included; maxillary short, equal to snout, three and three fourths in head; lower jaw equals diameter of eye. Four or five (rarely six) teeth in the front row of the premaxillary, the second tooth withdrawn from the line of the others, or the first pushed forward; four teeth in the inner series; maxillary with two or three teeth; mandible with four large teeth in front continued on the sides in a series of graduated teeth, the fifth tooth not notably smaller than the fourth tooth.

Gill-rakers about 5 + 9, very small, the longest one fifth of the diameter of the eye.

Scales deeply imbricate, without striae; anal sheath composed of a single series of small scales; caudal lobes scaled for at least one third of their length, the scales caducous. A well-developed axillary scale; lateral line very little decurved, the series of scales above and below it parallel with it.

Origin of dorsal equidistant from tip of snout and caudal; the highest ray one fifth of the length; adipose fin behind the vertical from the last anal ray; caudal lobes equal to the depth; anal origin behind the vertical from the last dorsal ray. Origin of ventrals equidistant from tip of snout and second scale in front of the dorsal or tip of last anal ray. Ventrals not reaching anal, the pectorals not reaching the ventrals.

Highly iridescent, silvery; a silvery lateral band two thirds as wide as eye, from humeral spot to caudal; a vertical humeral spot crossing the third and part of the fourth scale of the lateral line; a few pigment-cells on upper part of opercle and preopercle. Fins all hyaline, without chromatophores.

<sup>1</sup> In eleven of the largest, three have eighteen, five nineteen, two twenty, and one has twenty-one rays.

<sup>2</sup> Of ten one has 5.5 scales above the lateral line, and one has 3.5 below it; one has thirty-five, two thirty-six, four thirty-seven, and one thirty-eight pores in the lateral line.

Anterior anal rays of males with numerous recurved hooklets. Vertebrae 13 + 20; occipital process not extending back to the vertical from the posterior face of the skull.

Posterior air-bladder continued to the anal, its diameter two thirds that of the eye; its length one and a half times that of the anterior section; alimentary canal little longer than the entire fish.

## 2. *KNODUS MERIDAE* Eigenmann.

*Knodus meridae* EIGENMANN, Ann. mag. nat. hist., 1910, ser. 8, 7, p. 216 (Merida).

One specimen, 53 mm.      Merida, Venezuela      British Museum      P. M. Briceno

Head 4; depth 4; D. 10; A. 16; scales 4-33-2. Eye 3.25 in the head, about .8 in snout; 1.25 in the interorbital.

Basal half of caudal scaled. Slender; dorsal and ventral profiles scarcely arched.

Snout short, blunt; second suborbital covering the entire cheek, without a naked angle below its anterior corner; maxillary two in snout and eye; occipital process about one eighth the distance of its base from the dorsal.

Five teeth in the outer row of the premaxillary, the second retreated from the line of the rest; four teeth in the inner series of the premaxillary; maxillary with three broad multicuspid teeth; mandible with eight graduated teeth.

Two scales between the lateral line and anal; each scale of the sides with numerous diverging striae. Large scales on the base of the anal, scales on the base of the caudal lobes also large.

First dorsal a little nearer to the snout than to the base of the middle caudal rays, the highest ray a little more than five in the length; upper caudal lobe nearly five in the length, the lower slightly shorter; anal scarcely emarginate; ventrals reaching to anal, pectorals not quite to ventrals. A broad silvery band, tapering on the caudal peduncle, continued to the end of the middle caudal rays. No humeral or caudal spots.



3. *KNODUS MOENKHAUSII* (Eigenmann and Kennedy).

Plate 10, fig. 3.

*Pocilurichthys moenkhausii* EIGENMANN & KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 522 (Arroyo Trementina).*Bryconamericus moenkhausii* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Paraguay; Upper Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
10001 I.	1	} 29-43	Near Arroyo	} Anisits
10002 I. }	11		Trementina,	
10003 I. }			Paraguay	
20760	8 <sup>1</sup>	40-45	Tabatinga	Bourget

Head usually 4 (rarely 4.3); depth 3.5-3.75; D. 10, counting everything; A. 22-24; scales 5-39-3.5 or 4, rarely 38 scales in the lateral line; eye 2.5-2.66, equal to interorbital.

Slender, little compressed, the width about 2 in the depth; dorsal and ventral profiles equally curved, without elevations or depressions; preentral area rounded, postventral compressed; predorsal area narrowly rounded, without a keel, with a median series of (about 12) scales between the occipital process and the dorsal.

Occipital process about as broad as long, its length equals one eighth of the distance from its base to the dorsal, bordered on the side by one or two scales; interorbital flattish; frontal fontanel as wide as, and half as long as, the parietal; second suborbital covering the entire cheek to the lower opercular limb; maxillary slender, its anterior margin not conspicuously arched, its length not

<sup>1</sup>These eight have the following characters:

D.	A	Scales	Head	Depth	Eye in the length of head	Mandible in the length of head	Teeth of the pre-maxillary	Teeth of the maxillary
10	22	5-38-?	4	3.5	2.66	3.5+	4 & 4	5
10	24	?	4.3	3.75			4 & 4	3
10	22	5-39-?	4	3.5	2.5	3+	4 & 4	3
10	22	5-39-3.5	4.3	3.75	2.5	3+	4 & 4	3
10	24	5-38-4	4.2	3.5	2.5	3+	5 & 4	4
10	22	5-39-3.5	4	3.6	2.6	3+	4 & 4	4
10	24	5-39-3.5	4	3.7	2.5	3+	5 & 4	1
10	23	?	4	3.5	2.6	3	4 & 4	3

much greater than the length of the snout, three and a half in the head; lower jaw two and three fourths in the head; uniformly four teeth in the inner series of the premaxillary, six of the specimens from Tabatinga with four, two with five in the outer series, the second and sometimes the third removed from the line of the first and fourth; lower jaw with only three or three and a half large teeth in front and several small ones on the sides; two of the maxillaries of the left side of specimens from Tabatinga with one, four with three, one with four and one with five teeth.

Gill-rakers about  $6 + 9$ , very minute, the longest about one seventh of the diameter of the eye.

Scales closely imbricate, with four to six diverging striae; a well-developed anal sheath of about two rows of scales; caudal lobes scaled for about one third their length, the scales caducous; lateral line slightly decurved, parallel with the row of scales below it.

Origin of dorsal equidistant from tip of snout and base of caudal, or slightly nearer the latter; origin of the ventrals nearer the tip of the snout by a space equal to or greater than the diameter of the eye, equidistant from tip of snout and base of last anal ray; highest dorsal ray one fifth of the length; anal emarginate, its origin equidistant from tip of snout and second third of dorsal; ventrals scarcely reaching to anal, pectorals usually not quite to origin of ventrals.

An ill-defined silvery lateral band or if dissolved a band of scattered chromatophores from the eye to the base of the caudal, the cells sometimes concentrated to form a vertical, humeral spot crossing the lateral line. Vertebrae  $13 + 23$ .

In the types of *K. moenkhausii* the caudal sheath of scales apparently is not as well developed as in the specimens from Tabatinga. The lateral color-band is less well developed. I am not able to make out other differences with the material at hand.

#### 4. *KNODUS BREVICEPS* (Eigenmann).

Plate 10, fig. 2.

*Bryconannericus breviceps* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 105 (Goyaz); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434.

HABITAT.—Amazon Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20692 Cotypes	24	about 65-87	Goyaz	Honorio
3748 C.	19	21-62	Villa Bella	Haseman
3749 C.		45-48	Alcoboca	Haseman
3750 C.		44	Rio Mamoré	Haseman

Distinguished by its short head, small fins. Head 4.5-4.66<sup>1</sup>; depth in males and spent females about 3, in females with eggs 2.66-2.8; D. 10-11; A. 20-23. Scales 5½ or 6-38 to 41-4 above ventrals or anal. Eye 3 (rarely more, to 3.5); interorbital equals eye.

Elongate, rather heavy; dorsal profile slightly depressed at the nape; ventral profile more strongly arched than the dorsal; preventral area rounded, postventral area more narrowly rounded; predorsal area rounded, with a median series of about twelve scales from the dorsal to within one scale of the occipital crest.

Occipital process very short, not reaching one ninth the distance from its base to the dorsal, bordered by two scales on the side; frontal fontanel very short; suborbital covering the entire cheek; snout pointed, maxillary not much longer than snout, three and three tenths in head; mandible two and a half in head. Four or five teeth in the front row of the premaxillary, the first further forward than the rest, the second and fourth, or second and third, sometimes withdrawn from the line; only four in the second row; two or three teeth on the maxillary; lower jaw with four graduated teeth and a few small similar ones on the side.

Gill-rakers very short, one fourth the diameter of the eye, 6 + 10.

Scales regularly imbricate, thin, adherent, with about six feeble striae; anal sheath of a single row of scales; caudal lobes, with minute scales for about

<sup>1</sup> Ten specimens selected at random, have the following

	D.	A.	Scales	Depth	Eye
♀ with eggs	10 = (9½)	21	5.5-38-4	2.66	3
♀ " "	10	21	6-41-4	2.66	3.3
♀ " "	11 = (10½)	21	6-39-4	2.8	3.2
♀ " "	10	22	5-40-4	2.75	3
♀ " "	10	20	5.5-39-4	2.66	3
♂	10	23	5.5-36-4	2.86	3.5
♀ spent	10	20	6-41-4	3.1	3
♂	10	23	5.5-39-4	3	3
♀	10	22	5.5-40-4	3.1	3
♂	10	20	6-41-4	3	3

half their length; a well-developed axillary scale; lateral line but feebly decurved, the rows of scales above it and below it parallel with it.

Origin of dorsal about equidistant from tip of snout and base of caudal; ventrals a little nearer snout, equidistant from tip of snout and end of anal, not nearly reaching anal in the types, to the anal in the rest; highest dorsal ray four or five in the length; origin of anal under the dorsal or behind the last dorsal ray; pectoral not reaching the ventrals.

A plumbeous lateral band on the row of scales above the lateral line, lost in front of the dorsal, becoming dusky behind and continued to the end of the middle caudal rays as a faint band; an inconspicuous vertical humeral spot just above the third and fourth scales of the lateral line, sometimes crossing these. Dorsal and anal dusky.

Vertebrae 14 + 22.

Air-bladder in a gravid female small, ending bluntly behind, not curved down, but ending at the beginning of the posterior wall of the abdominal cavity; posterior part a little more than one and a half times as long as the anterior section, its diameter not equal to that of the small eye.

Alimentary canal very little longer than the body; pyloric coeca very large, about seven. Stomach contained insect larvae.

##### 5. *KNODUS VICTORIAE* (Steindachner).

Plate 16, fig. 3.

*Tetragonopterus victoriae* STEINDACHNER, ANZ. K. akad. wiss. Wien, 1907, **44**, p. 83 (Victoria on the Parnahyba).

One specimen, 3751 C.

53 mm.

Lagoa Parnagua, Jan. 17, 1908

Haseman

Head 4.25; depth 3+; D. 10; A. 20 (-22); scales 4.5-36 (to 38)-3.5; Eye 2.25-3; interorbital 2.8 in the head.

Elongate, not greatly compressed, the ventral profile a little more arched than the dorsal; preventral and predorsal areas rounded, the latter with twelve scales; occipital process very short, about one seventh of the distance between its base and the dorsal, bordered by two scales; interorbital rounded, a constriction between the fontanels. Cheeks entirely covered, maxillary shorter than eye; premaxillary with five teeth in the outer series of which the second and fourth are entirely withdrawn from the rest; four teeth in the inner series of the premaxillary; dentary with three large teeth, similar but much smaller ones on the side.

Dorsal rounded, its highest ray shorter than the head, its origin equidistant from snout and middle caudal rays. Caudal lobes longer than the head; origin of anal behind the vertical from the last dorsal ray; ventrals not reaching anal, their origin nearer base of last anal ray than snout; pectorals not reaching ventrals.

Scales very regular, with two or three striae; caudal with a few scales on the base of the lobes, extending further on the lower lobe than on the upper. Anal with a sheath of a single series of scales. Maxillary scale small.

Highly iridescent, a silvery lateral band; tip of dorsal hyaline, an oblique dusky streak through its middle. A dark spot on the base of the middle caudal rays, continued faintly to the tip of the middle rays and then obliquely across the lobes. A very faint humeral spot.

It is more than probable that the single specimen at hand is the *K. victoriae* described by Steindachner. His specimens have the silvery band bordered by dark above. A cherry-red spot at base of each caudal lobe in life.

#### 6. *KNODUS CHAPADAE* (Fowler).

Plate 10, fig. 1.

*Astyanax chapadae* FOWLER, Proc. Acad. nat. sci. Phil., 1907, p. 350, fig. 33 (Santa Anna da Chapada).  
*Bryconamericus chapadae* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

21829 Paratype. Acad. Nat. Sci. Phil. 44 mm. to base of caudal. Santa Anna da Chapada, Matto Grosso, headwaters of the Paraguay. Known only from the types.

Very closely related to *K. breviceps*, but with much longer head. Like *K. breviceps* except in the characters noted below.

Head about 3.75; depth about 3; D. 10; A. 20; scales 6-42-4.5; eye 3, equals interorbital.

Elongate, without prominent elevations or depressions in the profiles, the median series of scales in front of the dorsal not quite complete, replaced by the overlapping scales of the two sides from the occipital process to about the fourth scale behind the occipital process.

Maxillary equals snout, three and a half in head; mandible two and four tenths. Five teeth (three on one side) in the front row of the premaxillary, the second is withdrawn from the line, three several pointed teeth on the maxillary; mandible with four large teeth and several small ones on the side.

Base of caudal scaled; ventrals rather nearer tip of last anal ray than to snout.

Dusky, a very faint humeral spot; middle caudal rays black; anal and a band from the middle of the anterior dorsal rays to the tips of the last six rays with numerous chromatophores.

#### 7. *KNODUS JACUNDA* (Fowler).

*Bryconamericus jacunda* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 555, fig. 17 (Madeira River, about 200 miles east of W. Long. 62° 20', Brazil).

This species is known from the type 31 mm. long in the collections of the Philadelphia Academy of Natural Sciences. The following description is condensed from Fowler.

Head 3.5; depth 3; D. 10; A. 26; scales 5-38-4; 12 predorsal scales; snout 4 in the head, eye 2.8, interorbital 2.2, maxillary 2.75, depth of caudal peduncle 2.5.

Five large, broad teeth in the inner series of the premaxillary. No maxillary teeth. Suborbital completely covering cheeks. No interpolated rows of scales; anal with a basal series of scales along its whole length.

Origin of dorsal equidistant from caudal and front of eye; ventrals extending past origin of anal, pectorals beyond base of ventrals.

A vertical humeral spot crosses the third to fifth scales of the lateral line; a faint lateral streak.

This is evidently a young specimen and may belong to *Moenkhausia*.

#### 8. *KNODUS SMITHI* (Fowler).

*Bryconamericus smithi* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 557, fig. 18 (Tributary of the Madeira River near Porto Velho, Brazil).

This species is known from six specimens 24-35 mm. long, in the collections of the Philadelphia Academy of Natural Sciences. The description is condensed from that of Fowler.

Head 3.66-4; depth 2.87-3.2; D. 9-10; A. 27-30; scales 6-36 to 39-4; 12-14 predorsal scales; snout 3.12-3.8 in the head, eye 2.2-2.75, interorbital 2.4-2.8, maxillary 2-2.8, depth of caudal peduncle 2.25.

Six five-pointed teeth in the premaxillary. No maxillary teeth. Su

orbital completely covering cheeks. No interpolated rows of teeth; anal with a basal series of scales along its whole length.

Origin of dorsal midway between snout and base of caudal; ventrals reaching anal, pectoral extending beyond base of ventrals.

A vertical humeral spot over fourth and fifth scales of the lateral line.

"Closely related to the preceding species, though apparently differs in the smaller head and deeper body" Fowler.

### 5. MARKIANA Eigenmann.

For Edward Laurens Mark.

*Markiana* EIGENMANN, Smithsonian misc. coll. quart., 1903, **45**, p. 145.

TYPE.—*Tetragonopterus nigripinnis* Perugia.

Related to *Moenkhausia* and *Gymnocorymbus*, from which it differs in the squamation and the abbreviated caudal; the scales are crenate, very regularly arranged, becoming gradually smaller below the lateral line, the series extending about halfway up on the anal.

Compressed, deep, with a regularly arched ventral outline, the dorsal regularly being interrupted at the nape, the profile concave over the eyes. Head short, broad; an occipital fontanel continued as a groove on the occipital crest, a frontal fontanel extending forward to middle of eye; mouth small, the small maxillary nearly vertical, scarcely reaching the eye, slightly slipping under the preorbital; cheeks covered by the suborbitals. No maxillary teeth; outer row of premaxillary with triangular cutting edge, scarcely notched; inner teeth very heavy, with a few points arranged in a crescent; three anterior teeth of the mandible heavy, the fourth much smaller. Gill-membranes free from isthmus, slightly united to each other; gill-rakers setiform, about twelve on the lower arch; dorsal over origin of anal; margin of anal convex; adipose well developed; lateral line nearly straight, near the middle of the body. Nares together; tongue fleshy, adnate.

HABITAT.—Guiana and La Plata.

### *Key to the Species.*

- a.* A dark caudal spot; pectorals dark, extending much beyond origin of ventrals; depth 2.33; head 3.4–4.5; A. 44; scales 7–38–7 to 10. . . . . 1. *nigripinnis* (Perugia).  
*aa.* No caudal spot; uniformly silvery; A. 40; scales 7.5–41–7 to the ventral. . . . . 2. *geayi* (Pellegrin).

## 1. MARKIANA NIGRIPINNIS (Perugia).

Plate 13, fig. 3-5.

*Tetragonopterus nigripinnis* PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2a, **10**, p. 643 (Rio de la Plata); 1897, ser. 2a, **18**, p. 25 (Reyes; Rio Beni); EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 263, 273.

*Markiana nigripinnis* EIGENMANN, Smithsonian misc. coll. quart., 1903, **45**, p. 145; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438.

*Astyanax nigripinnis* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 30 (Paraguay).

*Tetragonapterus anamalus* STEINDACHNER, Anz. K. akad. wiss. Wien, 1891, p. 173; Ichthyol. beitr., 1891, **15**, p. 27; Sitzungsab. K. akad. wiss. Wien, 1891, **100**, p. 173, 369, pl. 3 (Rio Parana); EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 53.

HABITAT.—La Plata Basin.

## 2. MARKIANA GEAYI (Pellegriin).

*Tetragonopterus (Markiana) geayi* PELLEGRIN, Bull. Mus. hist. nat., 1908, **14**, p. 347 (Apuré).

*Markiana geayi* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438.

Known from a single specimen 104 mm. long, in the Jardin des Plantes.

## 6. GYMNOCORYMBUS Eigenmann.

γυμνός, naked; κόρυμβος, summit.

*Gymnocorymbus* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 94.

TYPE.—*Gymnocorymbus thayeri* Eigenmann.

Very deep, compressed, Tetragonopterini form: anal long, its margin nearly straight, its origin behind the origin of the dorsal; mouth moderate, the maxillary reaching below eye; first and second suborbital leaving a moderate naked area all around its lower margin; scales all cycloid; lateral line complete, caudal and anal largely scaled; maxillary with one or two teeth; premaxillary with an outer series of tricuspid teeth and an inner series of many pointed teeth.

HABITAT.—Amazons and Paraguay.

*Key to the Species.*

- a. Scales in lateral line 33-36; parietal fontanel arched over at base of occipital process; anal sheath of three or four series of scales; anal margin straight; anal and area above it not notably dark.
  - 1. *thayeri* Eigenmann.
- aa. Scales in lateral line 30-35; parietal fontanel not arched over; anal sheath of five or six series of scales; anal margin rounded; anal and area above it dark . . . . . 2. *ternetzi* (Boulenger).



## 1. GYMNOCORYMBUS THAYERI Eigenmann.

Plate 11, fig. 2.

*Gymnocorymbus thayeri* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 93 (Tabatinga to Gurupa); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437.

HABITAT.—Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
19242 type	1	40	Tabatinga	Bourget
20706	2	54	Teffé	Agassiz
19272, 20973	4	30-56	Cudajas	Thayer & Bourget
20804	1	70	Manacapuru	James
20807	9	50-77		
20998, 21065	20	40-50	Silva, Lake Saraca	Thayer
20984	29	38-57	Serpa	Thayer
20710, 20720	4	50-62	Villa Bella	Agassiz
20789	22	44-58	Santarem	Bourget
21007	8	45-55	José Fernandez	Cotinho
20724	2	65-72	Gurupa	Agassiz
21001	7	44-54	Jose Fernandez	Cotinho

Head 3.5 on an average; depth 1.7 on an average, ranging from 2.1 to 1.4; D. 11; A. 34-41<sup>1</sup>, most frequently 38 or 39; scales 7 to 8-33 to 36<sup>2</sup>-8 to ventrals; eye 2.25-3, 2.65 on an average; interorbital slightly less than the eye in the young, slightly more than the eye in the adult.

Very deep and very much compressed; the ventral profile much more arched than the dorsal, its deepest point at the origin of the anal; dorsal profile depressed over the eyes, humped in front of the dorsal; preventral area narrowly rounded in cross-section, postventral area more narrowly compressed; predorsal area narrowly rounded.

Occipital process one third or somewhat less the distance from its base to the dorsal; occipital fontanel continued to the tip of the occipital process as a groove, parietal portion sometimes partly arched over and demarked from the occipital groove; frontal fontanel about half the length of the occipital, its anterior end over the anterior margin of pupil; the profile beginning to

<sup>1</sup> Of sixteen counted one has thirty-four anal rays, two thirty-five, one thirty-six, one thirty-seven, four thirty-eight, five thirty-nine, one forty and one forty-one.

<sup>2</sup> Of twelve counted four have thirty-three anal rays, one thirty-four, five thirty-five and two thirty-six.

rise at the bridge between the fontanelles at an angle of about  $45^{\circ}$  from the line joining tip of snout and middle of caudal. Interorbital convex, snout very short, mouth very oblique; second suborbital leaving a moderate naked area around its entire free margin; maxillary equals snout and eye in front of pupil; normally four teeth in the front row of the premaxillary, the third slightly removed from the line of the rest; five teeth in the inner series; maxillary with one broad or two narrow teeth; mandible with four or five large, graduate teeth and several smaller ones on the side.

Gill-rakers about  $10 + 15$ , slender, the longest nearly half the length of the eye.

Scales cycloid, regularly imbricate, mid-preventral series very small; occipital process bordered by about five scales on each side; caudal lobes sealed to near their tips; scales of the sides continued without break into the anal sheath, which is composed of three or four series of scales in front and reaches up one third of the anal base. Scales everywhere cycloid, with several (five to seven on a scale above the middle of the lateral line) diverging striae; an axillary scale. Lateral line very little decurved, parallel with the row of scales just below it.

Origin of dorsal equidistant from tip of snout and base of upper caudal rays; its margin very oblique, the highest ray three in the length; adipose well developed, its origin about over the sixth anal ray from the last; origin of anal equidistant from tip of snout, and the third scale behind the dorsal, in the young, with the middle of the dorsal in the adult; margin of anal nearly straight; ventrals very small, equidistant from tip of snout and base of one of the last few anal rays, a little nearer to the tip of the snout than the dorsal or equidistant with the latter, not quite reaching anal in the adult; pectorals long, their bases elevated, their tips reaching the third scale above and third or fifth behind the origin of the ventrals.

Color similar to that of *Tetragonopterus argenteus*, a dark humeral bar followed by a lighter area and this again by a bar less well marked than the first; the first humeral bar is most intense above the third, fourth, and fifth scales of the lateral line, is vertical and extends in some cases to just behind the axil of the pectoral; the second bar extends across the ninth, tenth, and eleventh scales of the lateral line from in front of the dorsal; the area between the bars just above the lateral line is bright silvery. Lower sides brassy; fins hyaline to uniform dusky.

Males with hooklets on the anal.

Vertebrae 11 + 19. Six ray-bearing interhaemals in front of the first fully developed haemal spine, five between it and the second.

Second air-bladder more or less boot-shaped, the "toe" and "leg" of the same length, the toe sharply bent down, its tip reaching about halfway between the spinal column and anal, its greatest diameter half the length of the head; anterior air-bladder equal to the length of the "leg" of the posterior.

Alimentary canal about equal to the length without the caudal.

## 2. GYMNOCORYMBUS TERNETZI (Boulenger).

Plate 11, fig. 1.

*Tetragonopterus ternetzi* BOULENGER, Proc. Zool. soc. Lond., 1895, p. 528; Trans. Zool. soc. Lond., 1896, **14**, p. 35, pl. 8, fig. 2 (Descalvados; Matto Grosso); Boll. Mus. univ. Torino, 1900, **15**, no. 370, p. 2 (Urucum).

*Gymnocorymbus ternetzi* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 137.

HABITAT.—Paraguay and Guaporé Basins.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11435 I. Cotype	1	39 to base of caudal)	Descalvados	Ternetz
3294 C.	4	39-53	Arequa, Paraguay	Haseman
3295 C.	12	38-54	Jauru, Paraguay Basin	Haseman
3296 C.	1	37	San Joaquín, Guaporé Basin	Haseman

Very close to *G. thayeri*.

Head 3.25; depth 1.8; D. 11 or 12; A. 40-42; scales 8-30 to 35-8; eye 2.5 mm.; interorbital 2.5.

Parietal portion of the posterior fontanel not demarked from the groove on the occipital process; a single maxillary tooth.

Gill-rakers 9 + 14.

Anal sheath of five or six rows of scales covering half of the anal.

About ten striae on a scale above the middle of the lateral line.

Origin of dorsal equidistant from tip of snout and end of adipose fin or nearer caudal than snout; origin of anal and base of fourth dorsal ray equidistant from tip of snout; margin of anal rounded; origin of ventrals and fourth scale in front of dorsal equidistant from tip of snout, reaching anal.

The vertical bars more uniform in color throughout their height than in *G. thayeri*, separated by a wider interspace, the second bar largely behind origin of dorsal; anal and area above it, with the caudal peduncle dark; dorsal, dark.

## 7. THAYERIA Eigenmann.

In memory of Nathaniel Thayer.

*Thayeria* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 94.TYPE.—*Thayeria obliqua* Eigenmann.

Small, elongate Tetragonopterids reaching a length of near 80 mm., distinguished from all others by the unequally lobed caudal. It is otherwise near *Hemigrammus* and *Cretocheanes*. Caudal scaled, lateral line incomplete.

HABITAT.—Amazon Basin.

## THAYERIA OBLIQUA Eigenmann.

Plate 3, fig. 5, Plate 80, fig. 1, 2, 4, 6.

*Thayeria obliquus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 94 (Obidos); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20841 Cotype	25	47-76	Obidos	Bentos
3712 C.	5	47-62	Bastos	Haseman
3710 C. }	4	52-62	Maciél, Rio Guaporé	Haseman
3711 C. }				

Head about equal to the depth, 2.6 (in young)–3 in the length; D.10.5–11; A. usually 16 or 17, rarely 15 or 18<sup>1</sup>; scales 5–11 + 18–3; eye in the smallest equals twice the length of the snout, 2.4 in head, slightly greater than the interorbital; in the adult 2.9 in head, equal to the interorbital.

Little compressed, elongate, but little deeper than the head at the occiput; profile gently and evenly convex to the tip of the occipital process.

Preventral and postventral areas rounded. Predorsal area rounded, with a median series of scales.

Occipital process short, its length about six in the distance from its base to the dorsal, bordered by three scales; nares close together, separated by a flap only; frontal fontanel about half as long as the parietal, triangular, the anterior angle sometimes rounded, above the anterior margin of the pupil;

<sup>1</sup> In a count I found one with fifteen anal rays, five with sixteen, six with seventeen, and two with eighteen.

parietal fontanel somewhat wider than the frontal, extending as a groove to the tip of the short occipital process; surface of bridge between the fontanels below the surface of the skull; interorbital slightly convex; cheeks nearly covered, the naked area between the second suborbital and the preopercle only about one fifth the width of the third preorbital; a notch between the first suborbital and preorbital, the maxillary slipping under the preorbital but not under the first suborbital; premaxillary-maxillary border angulated, the maxillary reaching but little beyond anterior border of eye.

Mouth and dentition as in *Tetragonopterus*; the lower jaw with four heavy teeth on each side, abruptly followed on the side by minute teeth; premaxillary with three or four teeth on the front series, one of which frequently drops out of line; five graduated, multicuspid incisors in the inner series; the tips of the cusps very unequal in height, arranged in a nearly straight line. Maxillary without teeth.

Gill-membranes free from the isthmus, gill-rakers 7 + 15, slender, about one half as long as the filaments.

Scales with the margin slightly crenate, the exposed part of the scale with numerous slightly diverging striae; lateral line reaching to above ventrals; anal with a sheath; caudal partly scaled, ventrals with a slender axillary scale; lateral line scarcely decurved.

Fins with exception of caudal all small; the origin of the dorsal in the middle of the body, very little behind the ventrals; adipose fin over end of the small, emarginate anal. Pectoral about equal to head less opercle, not reaching to ventrals; ventrals a little nearer tip of snout than dorsal, slightly shorter than pectoral, not reaching anal; anus nearer ventrals than anal; anal emarginate, its highest (first and second divided) rays reaching at least to base of the last, sometimes to the tip of the last rays; last ray not reaching more than halfway to caudal; dorsal small, its height equals length of head less half the opercle; caudal large, forked at the middle, the lower lobe much the longer, equals distance from tip of snout to middle of pectoral.

Brassy; anterior anal lobe usually dusky; male with a black band from upper angle of gill-opening to base of middle caudal rays, then obliquely along the upper part of the lower caudal lobe; female with a similar band on the caudal; the band on the sides extending obliquely upward to the first row of scales below the origin of the dorsal which is the second row above the dark stripe of the male.

Posterior part of air-bladder about twice as long as the anterior, scarcely

reaching to above anal; alimentary canal about equal to the entire length of the fish; seven pyloric coeca. Intestine contains debris of minute insects and plant fibers.

Vertebrae 13 + 15.

### 8. PRISTELLA Eigenmann.

$\pi\rho\iota\sigma\tau\eta\varsigma$  = a saw, i. e. the fully dentate maxillary.

*Pristella* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 99.

TYPE.—*Holopristes riddlei* Meek.

This genus differs from *Hemigrammus* much as *Hemibrycon* differs from *Astyanax*.

Lateral line incomplete, caudal scaled for at least one third of its length; maxillary with teeth along nearly the entire anterior edge; gill-rakers long, setiform; gill-membranes free from each other and from the isthmus.

HABITAT.—Coasts of Guiana and Orinoco.

#### *Key to the Species.*

- a.* Depth 2.3–2.75; A. 20–24; dorsal, anal, and very frequently ventral, each with a conspicuous black spot; no caudal spot ..... 1. *riddlei* (Meek).  
*aa.* Depth 3.5; A. 16–18; caudal with a spot on the base of its middle rays, other fins all plain. .... 2. *aubynei* Eigenmann.

### 1. PRISTELLA RIDDLEI (Meek).

Plate 13, fig. 2.

*Holopristes riddlei* MEEK, Proc. U. S. N. M., 1907, **33**, p. 11 (Los Castillas).

*Pristella riddlei* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437; Mem. Carnegie, mus., 1912, **5**, p. 330, pl. 45, fig. 3.

HABITAT.—Guiana and Venezuela.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10896 Type	1	about 29	Los Castillas	Riddle
— Paratypes <sup>1</sup>	4	29–31	Los Castillas	Riddle
1317 C. 11798 I.	56	12–29	Wismar, Demerara River	Eigenmann
1308 C. 11800 I.	8	37–47	Georgetown Trenches	Eigenmann
1309 C. 11796 I.	233	26–45	Botanic Garden, Georgetown	Shideler
1310 C. 11799 I.	5		Christiansburg Canal	Eigenmann
1311 C. 11797 I.	3		Kumaka	Eigenmann

<sup>1</sup> Collection of Field Museum, Chicago.

Head 3.75-4; depth about 2.3-2.75; D. 11; A. 20-24; scales 5-32-3, 6-8 with pores; eye 2.64; snout 4.12; interorbital about 2.5 in the head.

Short, deep, especially in the female, not greatly compressed; ventral profile more regularly, and in the female more strongly arched than the dorsal profile; profile of head nearly straight, rising at the occipital process. Pre-ventral area broadly, the postventral more narrowly rounded; predorsal area keeled, with nine or ten scales.

Occipital process about one fifth of the distance from its base to the origin of the dorsal, bordered on the side by about three scales; head convex, the fontanels broadest at the base of the occipital process, tapering regularly to the tip of the process and to a point over the anterior margin of the eye; frontal fontanel about as long as the parietal without the groove; second suborbital covering the entire cheek or leaving a very narrow naked area at its middle, a wider one at its anterior and posterior ends; mouth very oblique, the premaxillary with a very short antero-posterior extent, the maxillary regularly convex in front, broader than the preorbital, about 3 teeth in the front row of the premaxillary, about 8 in the second. Those of the outer series incisors with parallel margins, with a prominent broad central lobe and two receding shoulders, the teeth becoming conical toward the sides; the posterior series pointed incisors, or three pointed incisors with the middle point much the longer. Maxillary with a few large teeth near its upper angle and minute conical teeth scattered along nearly the entire margin; lower jaw with a single series of teeth, imperfectly tricuspid, the points broad, not unlike those of the upper jaw, graduated, the lateral teeth minute, conical; snout and maxillary two and a fourth in head.

Gill-rakers  $8 + 12$ , a little over half the length of the eye.

Scales cycloid, very regularly imbricate, with numerous striae parallel with their convex margin and few divergent striae; anal sheath of a single series of scales along the base of the anterior rays; caudal sealed for about one third of its length.

Origin of dorsal and ventrals about equidistant from snout; pectorals reaching ventrals, ventrals to anal; anal emarginate.

A humeral spot over the third and fourth scales of the lateral line; no caudal spot; dorsal, anal, and ventrals each with a conspicuous, jet-black spot; dorsal spot not extending upon the last ray, and leaving base and tips of rays hyaline; anal spot covering the third and fourth fifths (from the base) of the rays forming the anterior lobe; ventral spot leaving the outer and inner rays and bases and tips of all the rays hyaline. Very brilliant in life,

translucent, the caudal bright red, upper parts tinged with red, basal part of dorsal and anal lobe below the black spots bright yellow, the distal parts milk-white.

## 2. *PRISTELLA AUBYNEI* Eigenmann.

Plate 13, fig. 1.

*Pristella aubynei* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 24 (Lama Stop-Off); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437; Mem. Carnegie mus., 1912, 5, p. 330, pl. 45, fig. 4.

HABITAT.—Lamaha Basin, British Guiana.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1042 C. Type	1	50	Lama Stop-Off	Eigenmann
1043 C. 11735 I.	203	20–50	Lama Stop-Off	Eigenmann
1044 C. 11736 I.	50	28–46	Cane Grove Corner	Eigenmann
1045 C. 11737 I.	21	35–49	Maduni Stop-Off	Eigenmann

This species is very abundant in the canal from Cane Grove Corner to Maduni Creek Stop-Off, British Guiana.

This species is placed in the genus with *P. riddlei* because in the technical characters they agree. There is every probability that they are not immediately descended from the same ancestor.

Head 3.75; depth 3.5; D. 10; A. 16–18; scales 6–31 to 33–3 rarely 4; 7 to 9 pores in the lateral line; eye 2.33; interorbital 3.

Elongate, heavy forward; ventral profile curved more than the dorsal, which is nearly straight to the dorsal, not depressed over the eye; preventral area broad, rounded, postventral area keeled; predorsal area narrowly rounded.

Occipital process triangular, very short, equal to one sixth of the distance from its base to the dorsal. Fontanel widest at the base of the occipital process, anterior fontanel slightly shorter than the posterior, triangular, its anterior pointed end a little in advance of the middle of the eye. Second suborbital leaving a wide naked area below, a narrower one behind. Mouth oblique; maxillary slender, its anterior margin nearly straight; two and three fourths in the head; five teeth in the front series of the premaxillary of which the middle one is withdrawn from the line of the rest. Inner series of teeth large, multicuspoid, graduate. Maxillary with numerous similar teeth; lower jaw with four or five graduate, multicuspoid teeth in front and minute ones on the side.

Gill-rakers about 6 + 11.



Scales thin, not conspicuously regularly imbricate; each scale with several nearly parallel horizontal striae; anal sheath composed of a single row of scales along the front of the fin; caudal lobes scaled for about one eighth of their length.

Origin of ventrals a little nearer tip of last anal ray than snout, slightly in advance of the dorsal; penultimate dorsal ray more than half the length of the longest which is three and three fourths in the length. Anal emarginate, ventrals reaching anal; pectorals not to ventrals.

In life, base of upper caudal lobe red, base of lower caudal lobe yellow, some yellow on under side of caudal peduncle and in front of anal. A circular spot about as large as eye on base of middle caudal rays. A dark line in front of dorsal, a series of spots behind it. A well-defined humeral spot on and over the second and third scales of the lateral line.

#### HEMIGRAMMUS GILL AND HYPHESSOBRYCON DURBIN.<sup>1</sup>

Compressed, rarely subcylindrical. Greatest depth on or near the vertical from the first dorsal ray. Postventral region narrow. Maxillary not slipping under the preorbitals. Lower jaw included, when the mouth is closed, but usually projecting beyond the snout when the mouth is open. Premaxillary teeth in two rows, the outer row more or less incomplete. All teeth conical or flat or fan-shaped, with 3-7 cusps, usually graduated from the enlarged median cusp.

Scales cycloid, regularly imbricate, striae few and variable in number. No interpolated scales or rows of scales. Anal sheath short, of a single, usually incomplete series of small scales. Lateral line somewhat decurved to nearly straight, the series of scales just below it parallel to it. Pores developed on the first three to eighteen scales.

The genus *Hemigrammus* was placed in the synonymy of *Astyanax* (Tetragonopterus) by Ulrey because Lütken had shown that in some supposed specimens of *T. fasciatus* the lateral line is complete, in others not. Two other species, *T. iheringii* and *T. oerstedii* are given by Ulrey as possessing these intermediate characters. But in the description of *T. oerstedii* it is specifically stated that the lateral line is complete, not interrupted. Also all the specimens of *T. iheringii* so far secured have a complete lateral line. This left *T.*

<sup>1</sup>The account of these genera has been worked up from my original manuscript by Mrs. Marion Durbin Ellis (Miss Marion Lee Durbin). She has devoted so much labor and care to these genera that she alone should be credited with the authorship.

*fasciatus* as an intermediate species. Lütken separated the species with an incomplete lateral line as a variety, *T. interrupta*. Upon reëxamining Lütken's specimens Eigenmann pronounces *T. fasciatus* and *T. interrupta* as being unquestionably distinct, differing in several characters besides the completeness or incompleteness of the lateral line.

During the examination of the very large series of specimens enumerated in the present work I found a complete lateral line in several species. Thus, among one hundred and two specimens of *Hemigrammus levis* from Lago do Maximo one had a complete lateral line. In over one hundred from other places the lateral line is incomplete. Of nineteen hundred and seventy-seven specimens of *Hyphessobrycon gracilis* from Brazil four have the lateral line complete. Of five specimens of *H. inconstans* two have the lateral line complete. Of nearly fifteen hundred specimens of *H. lütkeni* four have the lateral line complete and several others have it interrupted. Of one hundred and five specimens of *H. inconstans* from Quibdo, eighteen have a complete lateral line, eleven have it complete on one side and not on the other, and seventy-six have it incomplete on both sides.

*Hyphessobrycon* is separated from *Hemigrammus* by the single character, the scaled or naked condition of the caudal. Three out of the present fifty-four species of the two genera seem to be intermediate in regard to this character. Thus, *Hemigrammus elegans* has but few scales on the caudal and is put with *Hemigrammus* because it lacks the enlarged scale at the base of each caudal lobe which is characteristic of *Hyphessobrycon*. *H. analis* usually has only four or five scales on the caudal, but like *H. elegans* it lacks the enlarged basal scales and is placed with *Hemigrammus*. *H. stictus* usually has the basal scale and is, therefore, put with *Hyphessobrycon*, although it sometimes has a number of small scales actually on the base of the caudal lobes.

A question as to the validity of the species of these genera has been raised on the ground that these small fishes are immature, the young of other species. Accordingly dissections were made wherever sufficient specimens were at hand. One or more specimens were dissected of each of thirty-two species, and ovaries with large, in several cases apparently ripe, eggs were found in so many species that there is no room to doubt that, in most cases at least, we are dealing with mature specimens. The following table contains the result of the dissections in detail:

<i>Species</i>	<i>Number dissected</i>	<i>Result of the dissection</i>
<i>Hemigrammus ulreyi</i>	2	eggs present, but small
<i>coeruleus</i>	1	“ “ well developed
<i>unilineatus</i>	1	“ “ “
<i>marginatus</i>	1	“ “ “
<i>erythrozonus</i>	1	“ “ ripe, large and yellow
<i>levis</i>	3	“ “ ripe, “ “ “
<i>hyanuary</i>	1	“ “ large, ovary broken up
<i>brevis</i>	1	“ “ not large
<i>rodwayi</i>	1	“ “ large and ripe
<i>ocellifer</i>	1	“ “ well developed
<i>microstomus</i>	2	“ white and scattered in body cavity, comparatively few
<i>cylindricus</i>	1	“ present but not large
<i>analis</i>	2	male specimens.
<i>cupreus</i>	1	eggs large and evidently ripe
<i>Hyphessobrycon callistus</i>	1	eggs large and evidently ripe
<i>serpae</i>	1	specimen poorly preserved inside
<i>copelandi</i>	2	“ “ “ “
<i>bentosi</i>	2	“ “ “ “
<i>rosaceus</i>	1	eggs large and evidently about ripe
<i>panamensis</i>	1	specimen a male
<i>gracilis</i>	4	eggs fairly well developed
<i>taurocephalus</i>	1	eggs large, well developed
<i>parvellus</i>	1	“ “ “
<i>minimus</i>	1	no eggs, sex uncertain
<i>eos</i>	1	eggs large and very evidently ripe
<i>santae</i>	4	no eggs
<i>anasitsi</i>	1	eggs large, evidently ripe
<i>lütkeni</i>	1	eggs of unequal size, some large and full of yellow oil
<i>reticulatus</i>	1	eggs unequally developed, some quite large and ripe
<i>duragenys</i>	2	no eggs
<i>stictus</i>	1	eggs large, evidently ripe
<i>bifasciatus</i>	1	eggs large, evidently ripe

It seems quite certain that these genera are of polyphyletic origin, that several sections have been and are arising independently from *Astyanax* and *Moenkhausia* and probably other genera. These genera are conveniences rather than entities.

#### 9. HEMIGRAMMUS Gill.

$\eta\mu$  = half,  $\gamma\rho\alpha\mu\mu\eta$  = a line.

*Hemigrammus* GILL, Ann. Lyc. nat. hist. N. Y., 1858, 6, p. 420.

TYPE.—*Poeciliurichthys* (*Hemigrammus*) *unilineatus* Gill.

Minute or small; premaxillary teeth in two rows; the maxillary teeth wanting or reduced in number and restricted to the upper part of its free margin; scales in the lateral line 29–36; lateral line incomplete. Caudal scaled.

HABITAT.—Orinoco, Essequibo south to Paraguay, Rio das Velhas, and Rio Grande do Sul.

*Key to the Species.*

- a. Dorsal with a well-defined black spot.
  - b. Anal unmarked, a black line along its base. Dorsal black, with a wide white stripe from the tip of the first rays to the base of the last. Humeral spot horizontally elongate, continued as a black line to the caudal. Second suborbital leaving a wide naked margin behind and below. Maxillary with two or three conical or tricuspid teeth. D. 11, A. 23 to 25; scales 5 or 6–30 to 33–3.5.....1. *ulreyi* (Boulenger).
  - bb. Anal with black on the rays.
    - c. An iridescent blue line one scale wide extending from the base of the pectoral to the scale above the last anal ray; a wide light lateral stripe from the upper part of the eye to above the middle of the base of the caudal, interrupted or not by the vertically elongate humeral spot. Ventrals and anal lobe with a submarginal dark band. Second suborbital leaving a narrow naked margin. Maxillary with four or five, sometimes two or three, tricuspid teeth. D. 11; A. 20 to 22; scales 5–31 or 32–3.5.....2. *coeruleus* Durbin.
    - cc. Anal with an intense black bar from a little in front of the base of the first ray to the tips of the fourth and fifth rays. Humeral spot vertically elongate, often faint and sometimes lacking. Second suborbital leaving a narrow naked area below. Six small, tricuspid and conical teeth in the maxillary. D. 11, A. 23 to 27; scales 5–32 to 34–3 to 4.5.
      - 3. *unilineatus* (Gill).
    - ccc. Black on the dorsal restricted to the first three rays, usually not intense. An oblique blackish line from the base of the third to the tip of the seventh anal rays; tips of the second and third rays white. No humeral spot. Second suborbital without naked margins. Maxillary with three, 5-pointed teeth. D. 11; A. 23 or 24; scales 5–30 to 33–4.5.
      - 4. *elegans* (Steindachner).
  - aa. Dorsal without well-defined black markings (see also *elegans*).
    - d. No humeral or caudal spot.
      - e. A wide lateral streak from the middle of the caudal to the head and another narrower streak from above the anterior anal rays to the mandible without black chromatophores; the sides and back everywhere else dusky. Anal lobe and distal half of dorsal lobe dusky. Second suborbital about one half as wide as the eye; without naked margins. Maxillary 1.33 in the eye, with two to four, 3- to 5-pointed teeth. D. 11; A. 20 to 22; scales 5–31 to 34–3 to 3.5.....5. *erythrozonus* Durbin.
      - ee. Lateral stripe leaden, caudal lobes crossed by a broad, black marginal or submarginal band. Maxillary slender, about equal to the eye. D. 11; A. 20 to 24; scales 5–29 to 34–3 or 4.....6. *marginatus* Ellis.
      - dd. No humeral spot, caudal spot usually developed, (see also *marginatus*).
        - f. Maxillary without teeth.
          - g. Premaxillary teeth tricuspid or conical. Maxillary much shorter than the eye. D. 11; A. 17 to 19; scales 3.5–30 to 32–2.5 to 3.....7. *nanus* (Lütken).
          - gg. Premaxillary teeth 5- to 7- and 9-pointed. Maxillary equal to the eye. D. 11; A. 17 to 20; scales 5–30 to 34–3.5.....8. *levis* Durbin.
        - ff. Maxillary with teeth.
          - h. An unpigmented area between the caudal spot and the lateral stripe; caudal spot not continued forward on the caudal peduncle. Premaxillary teeth with 5 to 7 cusps. Second suborbital two thirds the eye in width. Depth 3.2. Maxillary with one 7-pointed tooth. D. 11; A. 24; scales 1–32–4.
            - 9. *micropterus* Meek.
          - hh. Caudal spot continued forward on the caudal peduncle; more or less continuous with the lateral stripe.

- i. A silvery area on the upper half of the caudal peduncle. Anal lobe dusky, lateral stripe and caudal spot very evidently continuous.
- j. Depth 3.6 to 3.8. Second suborbital about half the eye in width, leaving a naked margin behind and below. Maxillary with one or two narrow 4-pointed teeth. D. 11; A. 14 or 15; scales 5-32 or 33-3.  
10. *hyanuary* Durbin.
- jj. Depth 3. Second suborbital about three fourths the eye in width, in contact with the preopercle. Maxillary with three, 3-5 pointed teeth. D. 11, A. 23, scales 5-32 to 34-3.....11. *matei* Eigenmann.
- ii. No silvery area on caudal peduncle; caudal spot and lateral stripe only dimly connected. Second suborbital in contact with the preopercle.
  - k. Caudal peduncle slender, its depth 1.5 in the distance from the base of the middle caudal rays to the base of the last anal ray. Caudal spot not as wide as the caudal peduncle, on the middle caudal ray and not continued forward to the vertical from the adipose. Head 4; depth 2.7 to 3. Maxillary with two to four, conical or tricuspid teeth. D. 11, A. 22-24; scales 5-32 to 34-2 to 3.5.....12. *roadwayi* Durbin.
  - kk. Caudal peduncle deep, its depth equal to the distance from the base of the middle caudal rays to the base of the last anal ray. Caudal spot on the caudal peduncle, extending backward to the tips of the middle caudal rays, and forward to a vertical from one of the last five anal rays. Head 3.5; depth 2.6. Maxillary with two or three 3- to 5-pointed teeth. D. 11; A. 20 to 22; scales 5-29 to 33-3 or 4.....13. *brevis* Ellis.
  - kkk. Caudal spot intense, continued backwards along the middle caudal rays and along the edge of each caudal lobe. Anal falcate. Head 3.4. Maxillary with two 5-pointed teeth. D. 11; A. 16-19; scales probably 4 or 5-30 to 35-3.....14. *trilens* Eigenmann.
- ddd. Humeral and caudal spots both developed.
  - l. Dorsal equidistant from base of middle caudal rays and tip of snout, or nearer the caudal.
    - m. Origin of the dorsal equidistant from front of eye and caudal. Origin of the anal on the vertical from the last dorsal ray. Second suborbital leaving very narrow naked margins below and behind. Humeral spot distinct, vertically elongate, surrounded by a bright area, often with a second elongated spot behind the bright area. An iridescent spot on the upper half of the caudal peduncle. Caudal spot often continued along the edge of each caudal lobe. Maxillary with two or three, conical or tricuspid teeth. Depth 2.5; D.11; A. 22 to 26; scales 5-30 to 33-3 to 3.5.  
15. *ocellifer* (Steindachner).
    - mm. Origin of dorsal half the length of the head nearer the caudal than the snout. Origin of the anal on the vertical from the first or second dorsal rays. No bright area around the vertically elongate humeral spot. Second suborbital in contact with the preopercle. Maxillary with one tricuspid tooth. D. 11; A. 22; scales 5-30-3.  
16. *boulengeri* Eigenmann.
    - mmm. Origin of dorsal slightly nearer middle caudal rays than tip of snout. Origin of anal on the vertical from the first to third scale behind the dorsal. Caudal spot wider than long, not continued backwards on the caudal peduncle. Humeral spot small. Maxillary with two, 4- or 5-pointed teeth. Second suborbital leaving narrow naked margins below and behind. D. 11; A. 15-17; scales 5-30-3.....17. *iota* Durbin.
    - mmmm. Origin of dorsal equidistant from snout and base of middle caudal rays; origin of anal under dorsal; caudal spot not continued on the caudal; maxillary with four or five 6-pointed teeth; third suborbital in contact with the preopercle behind. D. 11; A. 24-25; lateral line 33-35.....18. *barrigona* Eigenmann.
  - ll. Origin of dorsal nearer snout than base of middle caudal rays. Humeral

- spot small and indistinct. Maxillary with two or three small conical or tricuspid teeth. Depth 3; D. 11; A. 20-23; scales 5-30 to 31-3 to 3.5.....19. *schmardae* (Steindachner).
- dddd.* Humeral spot present; no caudal spot, (humeral spot sometimes faint or lacking).
- n.* Anal rays 19-26.
- o.* Compressed, humeral spot often very faint.
- p.* Middle teeth of the inner row of the premaxillary 5- to 7-pointed; outer caudal rays unmarked. Frontal fontanel almost equal to the parietal.
- q.* Depth 2.75. Humeral spot very faint, horizontally elongate. Second suborbital sometimes in contact with the preopercle below. Maxillary three fourths of the eye, with two or three small conical or tricuspid teeth. D. 11; A. 23 to 26; scales 5-33 to 34-3.5...20. *lunatus* Durbin.
- qq.* Depth 2.8-3.5. Humeral spot faint sometimes vertically elongate. Second suborbital leaving narrow naked margins behind and below. Mouth very small. Maxillary little more than one half the eye, with two or three 4- to 7-pointed teeth. D. 11; A. 19 to 22; scales 5-31 to 34-3. 21. *microstomus* Durbin.
- qqq.* Depth 3.75. Humeral spot faint or diffuse, roundish. Second suborbital leaving narrow naked margins behind and below. Mouth moderately large. Maxillary equal to eye. First seven anal rays dusky. D. 11; A. 19-22; scales 5-30 to 33-3. Caudal not deeply scaled, 3 to 5 scales on each lobe.....22. *orthus* Durbin.
- pp.* The inner row of the premaxillary with five to seven narrow 3-pointed teeth. Sides of caudal lobes often edged with a narrow dusky line. Humeral spot faint, vertically elongate, behind the upper margin of the eye. Eye 2.9 in the head. Frontal fontanel small, one half the length of the parietal. Second suborbital leaving narrow naked margins behind and below. Maxillary with three to five conical or tricuspid teeth. D. 11; A. 20-22; scales 5 to 7-30 to 33-3 or 3.25. 23. *cupreus* Durbin.
- oo.* Subcylindrical, eye a little longer than broad, 2.25 in the head, snout comparatively long, 3.25 in the head. Maxillary nearly straight, with three to six tricuspid or conical teeth. Humeral spot small and intense. D. 11; A. 17-20; scales 5-30 to 34-3. 24. *cylindricus* Durbin.
- un.* Anal rays 12 to 14. Depth 3.2 to 3.5. Humeral spot diffuse. A wide silvery lateral stripe. Each dorsal scale marked with an intense dark spot. Second suborbital leaving considerable naked margins behind and below. Maxillary with two or three 6- to 7-pointed teeth. D. 11; A. 12-14; scales 5-30 to 32-3. 25.  *analis* Durbin.

## 1. HEMIGRAMMUS ULREYI (Boulenger).

Plate 17, fig. 1; Plate 78, fig. 9, 10.

*Tetragonopterus ulreyi* BOULENGER, Proc. Zool. soc. Lond., 1895, p. 529; Trans. Zool. soc. Lond., 1896, 14, p. 35, pl. 8, fig. 3 (Descalvados); Boll. Mus. univ. Torino, 1900, 15, no. 370, p. 3 (Urucum); EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 126 (Corumbá).

*Hemigrammus ulreyi* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 13; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 435; ELLIS, Ann. Carnegie mus., 1911, 8, p. 162 (Petas, Bolivia; Cáceres; Jauru; Rio Santa Rita).

HABITAT.—Paraguay Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11434 I. Cotype	1	33	Matto Grosso	
10162 I.	1	37	Corumba	Anisits
3048 C.	1	39	Near Petas, Bolivia	Haseman
3049 C.	4	38-41	Caceres	Haseman
3050 C.	16	35-44	Jauru	Haseman
3051 C.	4	38-43	Rio Santa Rita	Haseman

Head 3.25 to 3.5, depth 2.5 to 2.75; D. 10; A. 23-25; scales 5 or 6-30 to 33-3.5; eye 2 to 2.5 in the head, interorbital 3.

Compressed depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region flat, with sometimes a complete series of 11 scales. Predorsal region rounded having a regular median series of 9 scales.

Occipital process 4 in the distance between its base and the dorsal, bordered by three scales. Interorbital almost flat. Frontal fontanel triangular, narrower than and nine tenths as long as the parietals without the occipital groove. Second suborbital bordered behind and below by a naked margin, one half to one third of its own width. Mouth moderately large. Maxillary shorter than the eye, a little less than 3 in the head. Mandible heavy, equal to the eye. Premaxillary with five or six, 4- and 3-pointed teeth in the inner row, and three or four tricuspid ones in the outer row. Maxillary with two or three conical or tricuspid teeth. Dentary with a graduated series of four large, 3- to 5-pointed teeth, and a series of eight to twelve minute, conical ones on the side.

Gill-rakers 7 + 13.

Anal sheath short, consisting of 2 or 3 scales and covering the bases of the first four or five rays. Lateral line with pores on eight to ten scales.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray 2.5 in the longest, which is about one fourth of the length. Origin of the anal on the vertical from the last dorsal ray. Anal falcate. Ventrals on the vertical from the third scale in front of the dorsal. Ventrals just reaching the anal; pectorals just reaching the ventrals.

Dorsal with a triangular black spot having the first ray for its base and the base of the fourth ray for its apex, the fin from the second to the eighth ray margined with black; the last two rays with scattered chromatophores. Humeral spot narrow, horizontally elongate, and enlarged posteriorly not quite connected with the black lateral stripe. No caudal spot. Somewhat silvery

below the lateral stripe and on the cheeks. Anal and caudal dusky, a black stripe along the base of anal.

11434 I. U. from Matto Grosso, British Museum have all of these markings intense black, while in 10162 I. U. from Corumba they are exceedingly faint.

## 2. HEMIGRAMMUS COERULEUS Durbin.

Plate 17, fig. 2.

*Hemigrammus coeruleus* DURBIN, Bull. M. C. Z., 1908, **52**, p. 99 (Manacapuru); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436; ELLIS, Ann. Carnegie mus., 1911, **8**, p. 162 (Manaos).

HABITAT.—Amazon.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20801 Type	1	46	Manacapuru	James
20801 Paratypes	102	42–52	Manacapuru	James
3052 C.	3	49–58	Manaos	Haseman

Head 3.5; depth 2.75; D. 11; A. 20–22; scales 5–31 to 32; eye 2.5 to 2.7 in the head; interorbital equal to the eye.

Compressed; depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region slightly rounded, median series of scales somewhat irregular, a broad scale occupying the whole space between the bases of the ventrals. Predorsal region broadly rounded with a complete median series of nine scales.

Occipital process one eighth of the distance from its base to the dorsal, bordered by one and one half or two scales. Interorbital very slightly convex. Frontal fontanel triangular just half as long as the parietal without the occipital groove. Second suborbital leaving a narrow naked area behind and a slightly wider one below. Maxillary very slightly longer than the eye. Mandible two in the head. Snout short, mouth large. Premaxillary with five, 5-pointed teeth in the inner row; and four or five less frequently two, conical or tricuspid teeth in the outer row. Maxillary with four or five sometimes two or three, tricuspid teeth. Dentary with four large teeth, a smaller one, and four or five minute conical ones on the sides.

Gill-rakers 8 + 10.

Caudal scaled halfway to the tips of the longest rays. Anal sheath consisting of about five scales and covering the base of the first ten rays. Lateral line with pores on the seven or eight scales.



Origin of the dorsal the length of the eye farther from the snout than from the base of the caudal. The penultimate ray slightly more than half the length of the longest, which is about four and a half in the length. Caudal equal to the length of the head. Origin of anal on the vertical from the last dorsal ray or a little behind it. Anal broad, emarginate, the longest rays reaching the base of the last ray. Base of ventrals on the vertical from the second scale in front of the dorsal. Ventrals barely reaching the anal. Pectorals just reaching the ventrals.

Distal two thirds to three fourths of dorsal black or blackish, the color more intense in males; a submarginal bar on the anal lobe, and the proximal half of the ventrals, black, the rest of the anal rays often tipped with black. No caudal spot. Humeral spot vertically elongate, a bright area in front and behind it. A wide light lateral stripe from the upper part of the eye to above the middle of the base of the caudal, paralleled below by a less distinct, brown stripe. A bright iridescent blue streak from the pectoral to the scale above the last anal ray. The scales of the sides below the lateral stripe, except those bearing the blue stripe, with a greenish iridescence. Scales of the back and sides above the lateral stripe deeply outlined with dusky.

### 3. HEMIGRAMMUS UNILINEATUS (Gill).

Plate 21, fig. 5; Plate 78, fig. 8.

*Poecilurichthys Hemigrammus unilineatus* GILL, Ann. Lye. nat. hist. N. Y., 1858, 6, p. 420 (Trinidad); GÜNTHER, Cat. fishes Brit. mus., 1861, 5, p. 317.

*Tetragonopterus unilineatus* EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 285, (Para, Brazil); GILBERT, Proc. Wash. acad. sci., 1900, 2, p. 163 (Pernambuco).

*Tetragonopterus (Hemigrammus) unilineatus* REGAN, Proc. Zool. soc. London, 1906, p. 384 (Trinidad).

*Hemigrammus unilineatus* EIGENMANN and OGLE, Proc. U. S. N. M., 1907, 33, p. 12 (Trinidad); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 332; pl. 48, fig. 1; ELLIS, Ann. Carnegie mus., 1911, 8, p. 162 (Bragança; Maciél, Rio Guaporé).

HABITAT.—Trinidad, Guianas, and Amazons.

#### *Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
5779 I.	5	28-38	Para, Brazil	Hartt
10801 I.	1	40	Los Castillas, Venezuela	Riddle
1440 C., 11898 I.	110	35-48	Creek in Moro Passage	Shideler
1441 C., 11899 I.	22	31-41	Creek in Barima River	Shideler
1442 C., 11900 I.	86	23-48	Aruka River	Shideler

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
1443 C., 11901 I.	7	32-52	Isoro Mud Creek	Shideler
1444 C., 11902 I.	26	26-53	Mud flats in Demerara River below Wismar	Eigenmann
1445 C.	1	37	Georgetown Trenches	Eigenmann
1446 C., 11903 I.	4	41-47	Wismar	Eigenmann
1447 C., 11904 I.	5	35-47	Cumaka, Demerara River	Eigenmann
3043 C.	24	27-48	Bragança	Haseman
3044 C.	9	31-38	Maciél, Rio Guaporé	Haseman

Head 3.75; depth 2.2-3; D. 11; A. 23 to 27; scales 5-32 to 34-3 to 4.5; eye 2.25 to 2.5 in the head; interorbital narrower than the eye, 3 in the head.

Compressed, deepest at the vertical of the first dorsal ray; depth of head at base of occipital process three fifths in the greatest depth. Preventral regions rounded, without complete series of median scales. Predorsal region rounded without a regular series of median scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2.5 to 3 scales. Interorbital almost flat. Frontal fontanel very narrowly triangular, two thirds the length of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin below it. Mouth moderately large; maxillary equal to the eye; mandible a little longer, half the length of the head. Premaxillary with two to four conical or tricuspid teeth in the outer row and five or six, tricuspid teeth in the inner row. Maxillary with six small conical and tricuspid teeth. Dentary with a graduated series of five, 3- to 5-pointed teeth and a series of twelve or more minute conical ones on the sides.

Gill-rakers 6 + 10.

Basal third of caudal scaled. Anal sheath rudimentary or wanting. Lateral line with pores on 5 to 8 scales.

Origin of the dorsal equidistant from the snout and caudal, its penultimate ray one third of the longest which is 3.25 in the length. Origin of the anal on the vertical from the first scale behind the dorsal. Anal deeply emarginate. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals overlapping the anal a distance equal to half the length of the eye. Pectorals overlapping ventrals the same distance.

Dorsal black except the tips of the anterior 5 or 6 rays. An oblique black line on the anal from the base of the first to the tips of the fourth and fifth rays. Humeral spot vertically elongate, often faint and sometimes lacking. No caudal spot. Lateral stripe narrow. Scales of the back outlined with dusky.

## 4. HEMIGRAMMUS ELEGANS (Steindachner).

Plate 17, fig. 3.

*Tetragonopterus elegans* STEINDACHNER, Flussf. Südaml., 1882, 4, p. 36, pl. 7, fig. 4 (Obidos); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 285; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 285.

*Hemigrammus elegans* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 12; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20734	4	27-30	Santarem	Bourget
20869	1	35	Tapajos	Dexter, James, & Talisman
20840 <sup>1</sup>	1	28	Obidos	James

Head 3.5-3.67; depth 2.67-3; D. 11; A. 23 or 24; scales 5-30 to 33 4.5; eye 2.25-25; interorbital 3.

Compressed; depth of head at base of occipital process 1.75 in the greatest depth. Preventral region rounded; no regular series of median scales. Predorsal region rounded, with a regular median series of 9 scales.

Occipital process one fourth of the distance from its base to the dorsal, bordered by three scales, interorbital almost flat; frontal fontanel almost equal to the parietals without occipital groove. Second suborbital leaving a narrow naked area behind and below. Mouth large. Maxillary barely as long as the eye, mandible equal to the eye. Snout very blunt, equal to half the length of the eye. Premaxillary with an outer series of three 5-pointed teeth, and an inner series of five teeth, the center one of which has five cusps, the next three to six cusps each and the end one seven. The maxillary with three, 5-pointed teeth broader than those of the outer premaxillary series. Dentary with five, 3- to 5-pointed teeth followed by a few conical ones on the sides.

Gill-rakers about 7 + 10.

Caudal only partially scaled. Anal sheath of six scales covering the bases of the first seven rays. Lateral line with pores on from seven to eleven scales, not decurved.

Origin of dorsal a very little nearer snout than caudal. Penultimate ray three in the longest which is 2.75 in the length. Caudal probably equal to

<sup>1</sup> In part.

the head. Origin of the anal on the vertical from the eighth or ninth dorsal ray. Ventrals on a vertical from the first or second scale in front of the dorsal. Ventrals reaching just to the anal. Pectorals reaching to the ventrals.

The distal three fourths of the first, second, and third, and distal one fourth of the fourth dorsal rays pigmented. An oblique blackish line passing over the basal fifth of the third, the entire fourth and fifth, and the tips of the sixth and seventh anal rays. The first and distal half of the second and third anal rays, with intervening membrane, with a milk-white elongate spot. A very slender dark gray lateral stripe from the caudal peduncle to the vertical from the dorsal. A few chromatophores, much scattered and very faint, occur in the humeral region. The one 35 mm. specimen from Tapajos differed from the rest in the anal marking. In it the oblique line was lacking, giving place to a semicircular dark spot including the tips of the sixth, seventh, and eighth rays.

#### 5. HEMIGRAMMUS ERYTHROZONUS Durbin.

Plate 21, fig. 4.

*Hemigrammus erythrozonus* DURBIN, Ann. Carnegie mus., 1909, **6**, p. 56 (Erukin); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436; Mem. Carnegie mus., 1912, **5**, p. 333, pl. 48, fig. 2.

HABITAT.—British Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1448 C. Type	1	32	Erukin	Eigenmann
1449 C. Paratypes } 11905 I. Paratypes }	32	21–33	Erukin	Eigenmann

Head 3.75; depth 3.33 to 3.75; D. 11; A. 20–22; scales 5–31 to 34–3 to 3.5; eye 2.5 in the head, snout 1.5 in the eye. Interorbital less than eye, about 2.75 in head.

Compressed; depth of head at base of the occipital process 1.5 in the greatest depth. Preventral region rounded, without complete, regular series of median scales. Predorsal region rounded, median series of scales incomplete, always more or less irregular near the head.

Occipital process from one sixth to one seventh of the distance from its base to the dorsal; bordered by 3 scales. Interorbital convex. Frontal fontanel much narrower than parietal, triangular, two thirds of the parietal

without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Snout short; mouth moderately large. Maxillary 1.33 in the eye. Mandible equal to the eye, 2.5 in head, much weaker than the upper jaw. Width of naked area of the cheek 4 in the eye. Pre-maxillary with five 3- to 5-pointed teeth in the inner row, and two or three narrow tricuspid teeth in the outer row. Maxillary with two to four, 3- to 5-pointed teeth. Dentary with four or five, 5- to 7-pointed teeth in a graduated series, followed by seven or eight minute tricuspid and conical teeth on the sides.

Gill-rakers 8 + 6.

Anal sheath short, of three scales covering the bases of the first five anal rays. Caudal scaled over the basal one fourth. Lateral line with pores on six to nine scales.

Origin of dorsal equidistant from the snout and caudal, penultimate ray one third the longest which is 3.67 in the length. Origin of the anal on the vertical from the last dorsal ray. Anal deeply emarginate, longest ray 1.25 in the length of the base. Caudal equal to the length of the head. Ventral on the vertical from the second scale in front of the dorsal. Ventrals just reaching the first or second anal rays. Pectorals reaching the first scale in front of ventrals.

No true humeral spot; pores and margins of the first three or four scales in the lateral line heavily outlined with dusky and a group of large chromatophores just behind the eye on the head give the appearance of a humeral spot. Web of distal half of dorsal, almost all of the caudal, all of the ventrals, pectorals, and the web between the first seven anal rays dusky. Often a faint little dark spot at the base of each caudal lobe, no true caudal spot. Scales of the back and upper one third of the sides outlined with dusky. A broad stripe without chromatophores cherry-red in life, extends from the head to the caudal and halfway to the end of the middle caudal rays. Below this lateral stripe a dusky stripe two scales in width extends the length of the body. The belly and a streak on the sides, from just above the bases of the anterior ten anal rays to the mandible, without chromatophores. Bases of the anal and under side of the caudal peduncle black to dusky. Lips dusky. Dorsal lobe and upper part of the iris cherry-red in life.

## 6. HEMIGRAMMUS MARGINATUS Ellis.

## Plate 20, fig. 1.

*Hemigrammus marginatus* ELLIS, Ann. Carnegie mus., 1911, 8, p. 159, pl. 3, fig. 3 (Queimadas).

HABITAT.—Head waters of Parana, Paraguay, Guaporé, Itapicurú, and San Francisco Rivers.

*Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
3053 C. Type	1	38	Rio Itapicurú, Queimadas	Haseman
3054 C. Paratypes	22	13-39	Rio Itapicurú, Queimadas	Haseman
3055 C. Paratypes	3	23-29	Boqueirão near mouth of Rio Preto	Haseman
3056 C. Paratypes	4	28-30	Santa Rita, Rio Preto	Haseman
3057 C. Paratypes	3	29-33	Lagoa da Porto, near Barra, Rio San Francisco	Haseman
3058 C. Paratypes	6	26-38	Jacobina, Rio Jacobina, Itapicurú Basin	Haseman
3059 C. Paratypes	18	33-38	Pirapora, Rio San Francisco	Haseman
3060 C. Paratypes	42	18-42	Lagoa Pereira, Barra	Haseman
3061 C. Paratypes	5	37-42	Jaguara, Rio Grande	Haseman
3062 C. Paratypes	5	32-39	Rio Paiaia, Itapicurú Basin	Haseman
3063 C. Paratypes	8	32-38	Barreiras, Lagoas of Rio Grande, San Francisco Basin	Haseman
3064 C. Paratypes	6	22-38	Sete Lagoas, Rio das Velhas	Haseman
3065 C. Paratypes	3	29-35	Tinho, Rio Itapicurú	Haseman
3082 C. Paratypes	1	40	Maciel, Rio Guaporé	Haseman
3084 C. Paratypes	1	28	Mogy Mirim, a creek in São Paulo, Parana Basin	Haseman
C. Paratype	2	40-42	Rio Zinga, Itapicurú Basin	Haseman
3066 C. Paratypes	9	26-32	Riberão, Azul Lagoa 12 miles from Tieté	Haseman
3067 C. Paratype	1	21	Sapucay, Paraguay	Haseman
3077 C. Paratype	1	40	Caceres, Paraguay	Haseman
3083 C. Paratype	1	34	Rio Itapicurú, fazenda de Amaratu, 6 miles north of Bom Fin	Haseman

Head 3.6 to 3.8; depth 2.8 to 3.25; D. 11; A. 20 to 24; scales 5-29 to 34-3 to 4. Eye 2 in the head. Interorbital less than the eye, 2.75 in the head.

Compressed; depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral and predorsal regions rounded, without complete series of median scales.

Occipital process 5 or 6 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital slightly convex. Frontal fontanel triangular, almost as wide as the parietal and as long as the parietal without the occipital groove. Second suborbital little more than half the eye in width, usually with narrow naked margins behind and below. Mouth large; snout little more than half the length of the eye. Maxillary slender, just, or not quite, equal to the eye; 2 to 2.3 in the head. Mandible equal to the eye. Premaxillary with three or four tricuspid teeth in the outer row, and four or five, rarely six, 3- to 5-pointed teeth in the inner row. Maxillary with two or three, less often four, 3- to 5-pointed teeth, the posterior one sometimes conical. Dentary with a graduated series of four or five 3- to 5- and 7-pointed teeth, followed by a series of seven to twelve minute, conical ones on the sides.

Gill-rakers 6 + 10.

Caudal scaled over the basal one half. Anal sheath short, consisting of about 6 scales over the bases of the first 10 rays. Lateral line with pores developed on 5 to 14 scales.

Origin of the dorsal equidistant from the snout and caudal; penultimate ray short, one fourth of the longest, which is 3.67 in the length. Origin of the anal on the vertical from the first scale behind the dorsal. Anal emarginate, the longest ray 1.25 in the length of the base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals just reaching the anal. Pectorals just, or not quite, reaching the ventrals.

No humeral spot. Caudal spot faint or lacking. A heavy leaden lateral stripe often somewhat expanded near the end of the caudal peduncle, narrowed in the region just below the dorsal. Dorsal and anal somewhat dusky. A broad black marginal or submarginal band across the caudal lobes. When this band is submarginal the middle caudal rays are black also. The base of the caudal lobes hyaline, probably orange or red in life. Scales of the back and sides, above the lateral stripe outlined with dusky. Sides below the lateral stripe with pale bluish iridescence.

## 7. HEMIGRAMMUS NANUS (Lütken).

Plate 18, fig. 1; Plate 78, fig. 2, 7.

*Tetragonopterus nanus* LÜTKEN, Overs. K. Dan. selsk. Forh., 1874, p. 133 (Lagoa Santa); Vidensk. selsk., 1875, 12, p. 218, pl. 5, fig. 17 (Rio das Velhas); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 282; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 286.

*Hemigrammus nanus* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 15; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

HABITAT.—San Francisco Basin.

44958 U. S. N. M., 4 Cotypes

Lagoa Santa

Reinhardt

Head 3.9; depth 3.5–4; D. 11; A. 17–19; scales 35–30 to 32–25 to 3; eye 2.2 in the head, interorbital narrower.

Compressed; depth of head at the base of the occipital process 1.33 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded with complete median series of 11 scales.

Occipital process one seventh of the distance from its base to the dorsal, bordered by two and a half scales. Interorbital region somewhat convex. Second suborbital leaving a narrow naked area below and a much narrower one behind. Maxillary much shorter than the eye, 3.25 in the head. Mandible nearly as long as the eye, 2.75 in the head. Premaxillary with four, 3-pointed, teeth and sometimes one conical tooth in the inner row, and two similar but narrower teeth in the front row. Maxillary without teeth or with one tooth.

Caudal probably scaled; anal sheath of probably a single series of scales extending the entire length of the base of the fin. Lateral line with pores on from 4 to 7 scales.

Origin of the dorsal half length of the eye nearer the caudal than the snout, penultimate ray one third of the longest which is 4.2 in the length. Origin of the anal on the vertical from the last dorsal ray. Height of the anal nearly equal to the length of its base. Anal emarginate. Base of the ventrals on the vertical from the second or third scale in front of the dorsal. Ventrals not quite reaching the anal, and pectorals almost reaching the ventrals.

Fins all hyaline except where the large, diffuse dark caudal spot extends over the caudal, often reaching the ends of the middle rays. No humeral spot. An inconspicuous, silvery lateral band. The scales of the back outlined with pigment, a few chromatophores scattered over the sides except above the body-cavity.

#### 8. HEMIGRAMMUS LEVIS Durbin.

Plate 18, fig. 2.

*Hemigrammus levis* DURBIN, Bull. M. C. Z., 1908, **52**, p. 100 (Lago do Maximo); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436; ELLIS, Ann. Carnegie mus., 1911, **8**, p. 162 (Santarem).

HABITAT.—Amazon.



*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20738 Type	1	47	Lago do Maximo	Agassiz
20738 Paratypes	201	35-48	Lago do Maximo	Agassiz
20838 Paratypes	18	33-45	Chidas	James
20829 Paratypes	3	38-44	Chidas	James
20716 Paratypes	63	34-41	Villa Bella	Agassiz
20749 Paratypes	35	44-47	Lake Jose Assu	Agassiz
3088 C.	2	31, 38	Santarem	Haseman

Head 3.5 to 3.66; depth 3.2 to 3.6; D. 11; rarely 10; A. 17-20; scales 5-30 to 34 to 3.5; eye 2.5 to 2.67 in the head; interorbitals slightly less than the eye.

Compressed, head short, depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded, usually without complete series of median scales; sometimes a more or less regular series of 12 or 13 scales, the last enlarged. Predorsal region rounded, a regular median series of 9 scales.

Occipital process one sixth of the distance from its base to the origin of the dorsal. Bordered on the side by two or three scales. Interorbital slightly convex. Frontal fontanel narrowly triangular, just or a little less than equal to the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below it. Maxillary equal to the length of the eye. Mandible a little longer than the eye. Snout short, about 1.3 in the length of the eye; mouth large. Premaxillary with three, sometimes four, 3-pointed teeth in the outer row, and five, the middle 6- to 7- and the rest 7- to 9-pointed teeth in the inner row. Maxillary without teeth. Dentary with five large or four large and one small, 7- to 9-pointed teeth, several minute conical teeth on the sides.

Gill-rakers 8 + 12.

Anal sheath short, consisting of 2 or 3 scales covering the bases of the first 6 or 7 rays. Lateral line developed on from 6 to 11 scales.

Origin of the dorsal equidistant from snout and caudal. Penultimate ray 2.33 in the longest which is 3.67 to 4 in the length. Caudal equal to the length of the head.

Origin of the anal on the vertical from the first or second scale behind the dorsal. Ventrals on the vertical from the origin of the dorsal. Pectorals not reaching the ventrals; ventrals almost reaching the anal.

Middle caudal rays with a round black spot; all other fins unmarked. A slate-black lateral stripe beginning on the vertical of the adipose fin and gradually fading out again just below the origin of the dorsal. A silvery stripe on the scales below the lateral stripe. All of the scales below and half of the row just above the lateral stripe more or less covered with greenish golden iridescence that partakes of a turquoise tinge as it approaches the anal, especially in specimens from Lago do Maximo and Lake Jose Assu, Brazil.<sup>1</sup>

#### 9. HEMIGRAMMUS MICROPTERUS Meek.

Plate 18, fig. 3; Plate 78, fig. 6.

*Hemigrammus micropterus* MEEK Ms., Proc. U. S. N. M., 1907, **33**, p. 15 (Los Castillas); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436.

One specimen 10802 I      35 mm.      Los Castillas, Venezuela      O. Riddle

Head 3.8-4; depth 3.2; D. 10 or 11; A. 24; scales 4-32-4; eye 2.75 in the head, interorbital about equal to the eye.

Compressed, depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded, with complete median series of 10 scales. Postventral region not so narrow as in most species of the genus. Predorsal region rounded with complete median series of 9 or 10 scales.

Occipital process 5 or 6 in the distance from its base to the dorsal. Interorbital slightly convex. Frontal fontanel triangular and equal to the parietal without the occipital groove. Second suborbital in contact with the preopercle behind and below. Snout short and narrow, mouth rather small. Maxillary about equal to the eye. Mandible a little longer, 2.25 in the head. Premaxillary with an inner series of five, 5- to 7-pointed teeth and an outer series of two narrowly tricuspid teeth. Maxillary with one 7-pointed tooth. Dentary with a graduated series of five, 3- to 5-pointed teeth and a row of minute conical teeth on the sides.

Gill-rakers 6 + 9.

Anal sheath short, consisting of 1 or 2 scales. Lateral line with pores on 4 or 5 scales.

Origin of the dorsal equidistant from snout and caudal, the penultimate ray four ninths of longest which is 4 in the length. Origin of the anal on the vertical from the second scale back of the dorsal, anal slightly emarginate,

<sup>1</sup> One specimen from Lago do Maximo with a complete lateral line.

rather narrow. Caudal equal to the head. Ventral on the vertical from the first dorsal ray. Ventrals not quite reaching to the anal. Pectoral reaching to within one scale of the ventrals.

Fins all a little dusky, without definite markings. No humeral spot. A narrow black lateral stripe, faint from the head to the vertical from the origin of the anal and ending abruptly before it meets the caudal spot, which is continued to the end of the middle caudal rays. Scales of the back with rather broad dark margins.

#### 10. HEMIGRAMMUS HYANUARY Durbin.

Plate 18, fig. 4.

*Hemigrammus hyanuary* DURBIN Ms. EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

Eight specimens 20955

40-44 mm.

Lake Hyanuary

Navez

[Head 3.5-4; depth 3.6-3.8; D. 11; A. 14-15; scales 5-32 or 33-3; eye 2.67 in head, snout 1.5 in the eye; interorbital almost equal to the eye, very nearly 2.75 in the head.

Compressed, depth of head at base of occipital process 1.25 to 1.33 in the greatest depth. Preventral region rounded without complete series of median scales. Predorsal region rounded with regular median series of about 9 scales.

Occipital process about 8 in the distance from its base to the dorsal, bordered by 2 and 1.5 scales. Interorbital almost flat. Frontal fontanel much narrower than the parietal, equilaterally triangular, very small about one fourth the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Snout short but not so short as in *H. matei*; mouth large. Lower jaw included only when the mouth is closed. Maxillary 1.25 in the eye. Mandible about equal to the eye, 2.75 in the head. Premaxillary with four, narrow, tricuspid teeth in the outer row, and five, rarely six, large 3- to 5-pointed teeth in the inner row. Maxillary with one or two narrow 4-pointed teeth. Dentary with four or five large 4- to 6-pointed teeth in a graduated series followed by five or six minute teeth on the sides.

Gill-rakers 6 + 8.

Lateral line with pores developed on 8 to 10 scales.

Origin of the dorsal less than the length of the eye nearer the snout than the caudal; penultimate ray one third of the longest which is 3.75 in the length. Origin of the anal on the vertical from the second scale behind the dorsal. Anal

emarginate, the longest ray equal to the base. Anal armature developed on males. Ventrals on the vertical from the second scale in front of the dorsal. Ventrals reaching the first to third anal rays. Pectorals usually just reaching the ventrals.

Humeral spot absent, (a small and faint round spot on two specimens). Caudal spot very dark, round or vertically elongate, entirely covering the middle caudal rays. Usually extending forward onto the caudal peduncle so as to give the spot a roughly triangular shape, placed rather below the middle of the peduncle. Scales of the back dusky; those on the sides above the narrow lateral stripe outlined with dusky. The first half of the anal rays, all of the dorsal, ventrals, and pectorals dusky. Scales below the lateral stripe with bright greenish iridescence. An uneven iridescent spot on the caudal peduncle above and in front of the caudal spot.

#### 11. HEMIGRAMMUS MATEI Eigenmann.

Plate 19, fig. 1.

*Hemigrammus matei* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

One specimen 11438 I. Type

43 mm.

Argentina

Head 3.75-4; depth 3; D. 10; A. 23; scales 5-32 to 34-3; eye 2.2 in the head, snout 2 in the eye, interorbital slightly less than the eye, 2.6 in the head.

Compressed; depth of the head at the base of the occipital process, 1.5 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete median series of 10 scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital slightly convex. Frontal fontanel not narrower than the parietal, triangular and 1.25 in the length of the parietals without the occipital groove. Second suborbital in contact with the preopercle. Snout short and blunt, mouth large. Maxillary equal to or slightly less than the eye. Mandible a little longer than the eye, 2.14 in the head. Opercle incised above. Premaxillary with five or six 2- to 5-pointed teeth in the inner row and two or three similar but narrower ones in the outer row. Maxillary with three teeth, the posterior one 3-pointed, the anterior one 5-pointed. Dentary with graduated series of four or five teeth and several minute conical ones on the sides.

Gill-rakers 4 + 10.

One third of caudal sealed. Anal sheath of about 5 scales covering the basis of the first 8 anal rays. Lateral line with pores on 3 to 7 scales.

Origin of the dorsal one third of the length of the eye nearer to the caudal than to the snout, its penultimate ray two fifths of the longest which is 3.5 in the length. Origin of the anal on the vertical from the seventh anal ray. Anal emarginate, the longest ray 1.33 in the length of the base. Caudal somewhat shorter than the head. Ventrals on the vertical from the second scale in front of the dorsal. Ventrals not quite reaching the anal; pectorals reaching a little beyond the origin of the ventrals.

No shoulder-spot; a black lateral band beginning over the middle of pectorals as a thin line, becoming gradually broader to the caudal peduncle where it expands more rapidly, abruptly contracted at the base of caudal but continued for a short distance on the middle rays, the markings on the caudal being arrow-shaped. Back dusky, except the upper surface of upper caudal rays, and a spot behind the adipose. Fins all dusky. Spot on the back behind the adipose iridescent, yellowish, practically free from pigment.

## 12. HEMIGRAMMUS RODWAYI Durbin.

Plate 21, fig. 3.

*Hemigrammus rodwayi* DURBIN, Ann. Carnegie mus., 1909, 6, p. 58 (Georgetown Trenches), EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 334, pl. 48, fig. 3; ELLIS, Ann. Carnegie mus., 1911, 8, p. 162 (Bragança; above Cachoeira, Rio Nova, Goyaz, Piabana).

HABITAT.—Lowland rivers from the Orinoco to Para, also Rio Nova.

### *Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
1450 C. Type	1	46	Georgetown Trenches	Eigenmann
1451 C., 11906 I.	183	38–49	Georgetown Trenches	Eigenmann
Paratypes				
1452 C., 11907 I.	112	28–53	Botanic Garden, Georgetown	Shideler
1453 C., 11908 I.	4	24–26	Mud Creek in Aruka River	Shideler
1454 C., 11909 I.	7	34–40	Creek in Barima River	Shideler
3045 C.	6	31–40	Bragança	Haseman
	2	42–45	Georgetown Trenches	Ellis
12656 I.	3	31–36	Lama Stop-Off	Eigenmann
2949 C.	1	27	Above Cachoeira Rio Nova into Somno, into Tocantins, Goyaz	Haseman

Head 4; depth 2.75-3; D. 11; A. 22-24; scales 5-32 to 34-2.5 to 3.5; eye 2-2.33 in the head; snout 7.5 in the eye, interorbital very nearly equal to the eye, 2.4 to 2.5 in the head.

Compressed; depth of head at the base of occipital process 1.5 to 1.2 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, sometimes with complete series of 9 or 10 median scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital convex. Frontal fontanel narrower than the parietal, triangular and almost as long as the parietal without the occipital groove. Second suborbital in contact with the preopercle. Snout short, mouth moderately large. Maxillary not quite equal to the eye. Mandible a little longer than the eye, 2-2.4 in the head. Preopercle not deeply incised above. Premaxillary with four or five, 4- to 5-pointed teeth in the inner, and three or four tricuspid teeth in the outer row. Maxillary with two or four small uni- bi- or tricuspid teeth. Dentary with a graduated series of four, 5- to 7-pointed teeth, and several minute conical ones on the sides.

Gill-rakers 10 + 6.

Caudal much scaled. Anal sheath of about 5 scales covering the bases of the first 6 to 8 anal rays. Lateral line with pores on 9 to 12 sometimes on 15 scales.

Origin of the dorsal equidistant from snout and caudal, penultimate ray one third of the longest which is 3.5 in the length. Origin of the anal on the vertical from the first or second scale behind the dorsal. Anal deeply emarginate, longest ray 1.5 to 1.33 in the length of the base. Caudal half the length of the eye longer than the head, ventral lobe slightly larger than the dorsal lobe. Ventrals on the vertical from the first scale in front of the dorsal, just reaching the anal. Pectorals either not quite or just reaching the ventrals.

No shoulder-spot. A silvery lateral stripe extending from the caudal to about the vertical from the first dorsal rays, and continued forward by a few large scattered chromatophores. The black caudal spot usually extending nearly or entirely to the end of the middle caudal rays. Scales of the back and sides outlined with pigment above the lateral stripe, an olive stripe along the back, sides above stripe straw colored, scales below the stripe with a light blue iridescence. No iridescent spot on the back of the caudal peduncle. All fins somewhat dusky. Males with a cherry-red spot on the base of each caudal lobe, anterior anal margin with a white bar, broadest towards the tip, the rest

of anal and the base of dorsal tinged with red. Females with yellow on caudal, anal, and dorsal in place of the red described in the case of males. The white bar on anal lacking in females.

### 13. HEMIGRAMMUS BREVIS Ellis.

*Hemigrammus brevis* ELLIS, Ann. Carnegie mus., 1911, 8, p. 161, pl. 3, fig. 4 (Barreiras).

HABITAT.—San Francisco Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3068 C. Type	1	35	Barreiras, Lagoas of Rio Grande of San Francisco Basin	Haseman
3069 C. Paratypes	2	31, 33	Penedo, Rio San Francisco	Haseman
3070 C. Paratypes	3	34-36	Barreiras, Lagoas of Rio Grande	Haseman
3071 C. Paratypes	33	20-27	Boqueirão, Rio Preto	Haseman

Head 3.5; depth 2.6; D. 11; A. 20 to 22; scales 5-29 to 33-3 to 4. Eye 2 to 2.3 in the head; interorbital less than the eye, 2.7 in the head.

Compressed; depth of head at the base of the occipital process about 1.6 in the greatest depth. Preventral and predorsal regions rounded.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 2 scales. Interorbital slightly convex. Frontal fontanel triangular, as wide as the parietal, and almost equal to the parietal without the occipital groove. Second suborbital in contact with the preopercle. Mouth large, snout short, little more than one half the eye. Maxillary and mandible approximately equal to each other and to the eye. Premaxillary with three to five tricuspid teeth in the outer row, and five, rarely four, 3- to 5-pointed teeth in the inner row. Maxillary with one to three, 3- to 5-pointed teeth. Dentary with a graduated series of five 5-pointed teeth followed by a series of seven to eleven minute tricuspid and conical ones on the sides.

Gill-rakers 10 + 9 with 5 minute spines behind the last two on the shorter limb.

Caudal scaled over the basal one half. Anal sheath short, composed of 5 scales covering the bases of the first 9 anal rays. Lateral line with pores developed on the first 5 to 9 scales.

Origin of the dorsal equidistant from the snout and the caudal; penultimate ray about one fifth of the highest, which is 3.67 in the length. Caudal

very little longer than the head. Origin of anal on the vertical from the last dorsal ray. Anal deeply emarginate, the longest ray 1.25 in the anal base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals reaching the second to fourth anal ray. Pectorals reaching to the first scale in front of the ventrals or to the second scale behind the ventrals.

No humeral spot. Caudal spot not quite as wide as the caudal peduncle, but extending from the tips of the middle caudal rays to the vertical from one of the last five anal rays, more diffuse at the anterior end. Lateral stripe very faint, heavily overlaid with silvery. Fins all a little dusky. Scales of the back outlined with dusky. Cheeks and sides below the lateral stripe with bluish iridescence.

#### 14. HEMIGRAMMUS TRIDENS Eigenmann.

Plate 19, fig. 2; Plate 78, fig. 4.

*Hemigrammus tridens* EIGENMANN, Proc. U. S. N. M., 1907, 33, p. 15 (Arroyo Pypucu); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Arroyo Pypucu, Paraguay.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11262 I. Type	1	20 to base of caudal	Arroyo Pypucu, Paraguay	Anisits
11262a I.	2	17, 18 to base of caudal	Arroyo Pypucu, Paraguay	Anisits

Head 3.4; depth 3; D. 11; A. 16–19; scales probably 4 to 5–30 to 35–3; eye 2.4 in head, interorbital 3+ in the head.

Compressed, depth of head at the base of the occipital process 1.75 in the greatest depth. Preventral region rounded without complete series of median scales. Predorsal region rounded or very slightly keeled, with complete regular series of 11 scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2–2.25 scales. Interorbital slightly convex. Frontal fontanel triangular, its base narrower than the parietal and half as long as the parietal without the occipital groove. Second suborbital in contact with the preopercle. Snout short, mouth large; maxillary shorter than the eye, 3 in the head. Mandible about equal to the eye. Premaxillary with an inner row of five teeth, with 5 long points, the middle one much the longest, the outer row with two nar-



row tricuspid teeth. Maxillary with two 5-pointed teeth, the points nearly equal in length. Dentary with a graduated series of four large, 4- or 5-pointed teeth and two quite small tricuspid ones.

Gill-rakers 6 + 10.

Anal sheath short. Lateral line with pores on 4 to 7 scales.

Origin of the dorsal almost the length of eye nearer the caudal than to the snout, longest ray 4 in the length. Origin of the anal on the vertical from the second scale behind the dorsal. Anal falcate, the longest ray equal to the length of the base; origin of ventrals on the vertical from the first scale in front of the dorsal, reaching the anal. Pectorals not reaching the ventrals.

Dorsal and anal very slightly dusky. No distinct humeral spot, a few scattering chromatophores forming a horizontally elongate bar extending from the head to vertical from the base of the ventrals, where the narrow black line-like lateral stripe begins. The caudal spot forms a jet-black band across the end of the tail, continued forward to a blunt median point upon the lateral stripe, and backwards along the edge of each caudal lobe and along the middle caudal rays, but not to their tips. Scales of the back outlined with pigment.

#### 15. HEMIGRAMMUS OCELLIFER (Steindachner).

Plate 19, fig. 3; Plate 21, fig. 2.

*Tetragonopterus ocellifer* STEINDACHNER, Flussf. Südamer., 1882, 4, p. 32, pl. 7, fig. 5, (Villa Bella; Cudajas); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 286 (Amazon and Solimoes Basin).

*Holopristis ocellifer* EIGENMANN, Smith. misc. coll. quart., 1903, 45, p. 145; EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 11.

*Hemigrammus ocellifer* ELLIS, Ann. Carnegie mus., 1911, 8, p. 162 (Bragança); EIGENMANN, Mem. Carnegie mus., 1912, 5, p. 335, pl. 48, fig. 4; FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 544, fig. 13 (Rio Madeira).

HABITAT.—Amazon; British Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
Part of 20842	33	28-44	Obidos	Col. Bentos
21017	1	38	Curupira	Maj. Cotinho
20774	16	37-28	Tabatinga	Bourget
20969	5	31-36	Cudajas	Thayer & Bourget
1455 C., 11910 I.	109	26-37	Gluck Island	Eigenmann
1456 C., 11911 I.	3	small	Konawaruk	Eigenmann
1157 C., 11912 I.	4	28-29	Malali	Shideler
3046 C.	11	31-40	Bragança	Haseman

Head 3.25 to 3.5; depth 2.5 to 2.75; D. 10 or 11; A. 22 to 26; scales 5-30 to 33-3 to 3.5; eye 2.25 to 2.5 in head, snout little more than one half of the eye, interorbital about equal to the eye, 2.5 in the head.

Compressed; depth of head at base of occipital process 1.33 in the greatest depth. Preventral region rounded, sometimes with a regular median series of 11 scales. Predorsal region rounded with complete median series of 11 scales.

Occipital process 5 in the distance from its base to the origin of the dorsal, bordered by about 3 scales. Interorbitals slightly convex. Frontal fontanel not narrower than the parietal, equal to the parietals without the occipital groove. Second suborbitals leaving a narrow naked margin behind and below. Snout rather short; mouth large. Maxillary slightly less than the eye. Mandible very little longer than the eye, about 2.33 in the head. Premaxillary with five, 3- to 5-pointed teeth in the inner row, and two to four smaller, 3- to 4-pointed teeth in the outer row. Maxillary with two or three small tricuspid or conical teeth. Dentary with a graduated series of four large 5-pointed teeth, followed by nine or ten minute tricuspid and conical teeth.

Gill-rakers 6 + 11.

Anal sheath of about 13 scales, the first 7 extending over the bases of the first 11 anal rays, the remaining 5 or 6 quite small and inserted between the scales above the anal, but not touching the anal rays. Caudal scaled over the basal one third. Pores developed on 6 to 8 scales.

Origin of the dorsal half the length of the eye nearer the caudal than the snout, the penultimate ray one third of the longest, which is 3+ in the length. Origin of the anal on the vertical from the middle or last dorsal ray. Anal emarginate, the longest ray 1.33 to 1.5 in the length of the base. Caudal less than the width of the eye longer than the head. Ventrals on the vertical from the second scale in front of dorsal; ventrals reaching to second or third anal ray. Pectorals reaching a little beyond the base of ventrals.

Humeral spot distinct, vertically elongate, paralleled in front and behind by a bright bar nearly as wide as the humeral spot itself; a secondary, fainter, dark bar behind the posterior bright bar. A black (brown in very old alcoholic specimens) caudal spot not extending much, if at all, onto the middle caudal rays; a bright ring around the entire caudal peduncle, from the caudal spot to last anal ray, iridescent above the narrow sharp gray lateral stripe. The base of the caudal lobes and upper part of the peduncle a rusty red in life. Dorsal somewhat dusky, with an orange tinge when alive, caudal and anal

rays tipped with dusky black, distal third of second anal rays white. Anal, ventrals, and pectorals yellow in life. Scales of the back outlined with pigment, a few large chromatophores scattered over the cheeks.

16. *HEMIGRAMMUS BOULENGERI* Eigenmann.

Plate 78, fig. 3.

*Tetragonopterus fasciatus interruptus* EIGENMANN (in part, *non* Lütken) Ann. N. Y. acad. sci., 1894, 7, p. 634 (Rio Grande do Sul).

*Hemigrammus boulengeri* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 15; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Rio Grande do Sul.

One specimen 11073 I. Type 45 mm. Rio Grande do Sul Von Ihering

Head 3.33; depth 2.66; D. 11; A. about 22, scales 5–30–3; eye 2.6 and interorbital 2.75 in the head.

Compressed; depth of head at the base of the occipital process 3 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with regular series of 11 scales.

Occipital process 7 in the distance between its base and the dorsal, bordered by 3.25 scales. Interorbital slightly convex. Frontal fontanel triangular, broader than, and two thirds as long as, the parietal without the occipital groove. Second suborbital in contact with the preopercle. Snout short; mouth large. Maxillary 2.75 and mandible 2.33 in the head. Premaxillary with five 5-pointed teeth in the inner series, and three tricuspid teeth in the outer series. Maxillary with one 3-pointed tooth. Dentary with a graduated series of five 5-pointed teeth and three very small, 3-pointed teeth.

Gill-rakers 6 + 8.

Caudal probably scaled. Lateral line with pores on about 7 scales.

Origin of dorsal half the length of the head nearer to the caudal than to the snout, penultimate ray 2.75 in the longest, which is almost 4 in the length. Origin of anal on the vertical from the first or second dorsal ray. Anal somewhat emarginate, longest ray 1.25 in the base. Ventrals on the vertical from a point 1.75 the length of the eye in front of the dorsal. Ventral reaching to the base of the fourth anal ray. Pectorals a little more than reaching the ventrals.

Humeral spot vertically elongate, distinct; a narrow black lateral line lying deeper than the caudal spot and not connected with it; caudal spot well

defined, not quite extending to the end of the middle caudal rays, lower half of the caudal with many pigment-cells and blackish, upper half hyaline; basal two thirds of anal dusky.

# 17. HEMIGRAMMUS IOTA Durbin.

Plate 22, fig. 7.

*Hemigrammus iota* DURBIN, Ann. Carnegie mus., 1909, 6, p. 60 (Gluck Island); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Essequibo River.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1458 C. Type	1	18	Gluck Island	Eigenmann
1460 C. 11914 I.	4	19-21	Rockstone	Eigenmann
Paratypes				
1459 C., 11913 I.	7	18-21	Gluck Island	Eigenmann
Paratypes.				

Head 3.6; depth 3.4; D. 11; A. 15-17; scales 5-30-3; eye 2.33-2.5; snout 1.67 in the eye. Interorbital slightly less than the eye, 2.8 in the head.

Compressed; depth of head at the base of occipital process 1.33 in the greatest depth. Preventral region rounded, usually without complete series of median scales. Predorsal region rounded, usually with complete series of 9 to 11 median scales.

Occipital process 7 or 8 in the distance from its base to the dorsal, bordered by 2 scales on each side. Interorbital convex. Frontal fontanel much narrower than the parietal, triangular, three fourths of the parietal without the occipital groove. Second suborbital covering the entire cheek. Snout short, mouth comparatively large. Maxillary 1.4 in the eye. Mandible a little longer than the eye, 2+ in the head. Premaxillary with five, 3- to 5-pointed teeth in the inner row and two or three narrow tricuspid teeth in the outer row. Maxillary with one or two broad teeth with 4 or 5 points. Dentary with a graduated series of four or five large, 5-pointed teeth, followed by four or five minute conical ones on the side.

Gill-rakers about 9 + 7.

Anal sheath short, of 7 scales, covering the base of the first 8 or 9 anal rays. Lateral line with pores on the first 6 to 8 scales.

Origin of dorsal less than half the length of the eye nearer the caudal than the snout. Penultimate ray two fifths of the longest, which is 3.2 in the length. Origin of the anal on the vertical from the first to third scale behind the dorsal. Anal deeply emarginate, the longest ray almost equal to the base. Caudal a very little longer than the head. Ventrals on the vertical from the second or third scale in front of the dorsal. Ventrals just reaching the anal, pectorals barely reaching the ventrals, more often only reaching to the second or third scale in front of the ventrals.

Humeral spot conspicuous, black, vertically elongate, surrounded by a small light area. Caudal spot variable in intensity, vertically elongate, I-shaped, not extending on to the caudal rays, and not continuous with the narrow black lateral stripe, which is overlaid with silvery. Scales of the postdorsal region each marked with a round dark spot in addition to a few scattered chromatophores. Scales of the predorsal region with round spots less distinct and the general dusky shading more pronounced. Scales of the sides above the lateral stripe outlined with dusky. A few chromatophores scattered over the region between the anal and the lateral stripe. Some indications of a very faint secondary humeral spot. Fins all a little dusky. Caudal with an orange spot on the base of each lobe (evident in fresh specimens only).

#### 18. *HEMIGRAMMUS BARRIGONAE* Eigenmann and Henn.

Plate 93, fig. 2.

*Hemigrammus barrigona* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 24, p. 232 (Barrigona).

HABITAT.—Rio Meta, Colombia.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
13423 I. Type	1	41	Barrigona, Rio Meta	Gonzales
13424 I. Paratypes	65	25-43	Barrigona, Rio Meta	Gonzales

Head 4; depth 2.6-3; depth of caudal peduncle 9-10; D. 11; A. 24-25. Scales 33-35 in a longitudinal series, about 11 in a transverse series. Development of scales with lateral line pores extremely variable and not even equal on both sides of the same specimen. Usually a continuous series of at least 14 scales with pores, thence lateral line discontinuous; pore usually developed on last scale in the series. One specimen has the lateral line  $16 + 3 + 1 +$

11 + 2, (the italicized numerals represent scales with pores). Another has 17 + 6 + 2 + 4 + 2 + 3. A specimen of 41 mm. has the lateral line 17 + 14 + 2 on the left side and 16 + 18 + 1 on the right side. Of others, one, 34 mm. has respectively 24 + 8 + 3 and 20 + 8 + 7; one, 37 mm. has 15 + 19 and 16 + 18; and one, 42 mm., has 24 + 5 + 5 on the left and 24 + 7 + 3 on the right side. The lateral line is developed on the seventh transverse series of scales. Scales in the type are 6-16 + 18 + 1-4. Eye 2.6 in head, about equal to or slightly greater than the interorbital.

Compressed, rather deep, caudal peduncle slender; predorsal area arched or rounded with a variable median dorsal series of from 9 to 12 (usually 10) scales; preventral area rounded, with an ill-defined median series of about 12 large scales. Occipital process about 5 in the distance from its base to the dorsal, bordered by three scales. Skull convex; fontanels moderately large; second suborbital in contact with the preopercle behind.

Mouth terminal; snout blunt, about one half the eye; maxillary short, about three fourths the length of the eye. Premaxillary with three tricuspid teeth in the outer row and five 5- to 6-pointed teeth in the inner row. Maxillary with four or five minute, 6-pointed teeth, visible only in preparations. Mandible with four or five 6-pointed incisors in each ramus, their tips flaring outwards. Caudal scaled over one third of the basal lobe. Gill-rakers 7 + 6.

Origin of dorsal about equidistant from snout and base of middle caudal rays, its height 3.5 in the length. Origin of anal on vertical from last ray of dorsal, fourth to sixth rays elongate, forming an anterior lobe, its height about 4.7-5 in the length, two large scales overlapping on the anterior margin. Caudal deeply forked, its lobes about equal to the height of the dorsal; pectorals do not reach the ventrals, the latter just overlap on the anal.

General coloration light olivaceous; operculum, cheeks, and snout underlaid with bright silvery. Top of head dusky, no predorsal median line. A broad horizontal lateral stripe from the hind margin of the operculum to the caudal base, here expanded to form an ill-defined, oval caudal spot. An indistinct humeral spot is overlaid by this lateral stripe. A conspicuous dark band along the entire anal base, outer margin of anal sometimes dark tipped. Fins otherwise without color.

## 19. HEMIGRAMMUS SCHMARDAE (Steindachner).

Plate 20, fig. 2; Plate 78, fig. 1.

*Tetragonopterus schmardae* STEINDACHNER, Flussf. Süd-am., 1882, 4, p. 37, pl. 7, fig. 6 (Tabatinga); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54.

*Hemigrammus schmardae* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 333 (Peruvian Amazon); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 13; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; ELLIS, Ann. Carnegie mus., 1911, 8, p. 163 (Santarem).

*Tetragonopterus santaremensis* ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 283 (Santarem).

*Hemigrammus melanocephalus* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 543, fig. 12 (Tributary of Rio Madeira near Porto Velho).

HABITAT.—Amazons.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
—	4	34–43	Manaos	Agassiz
5174 I.	1	28	Brazil	
5499 I.	2	29	Santarem	Menot
8085 C.	1	39	Santarem	Hasemann

Head 3.4–3.6; depth 3; D. 11; A. 20–23; scales 5–30 to 34–3 to 3.5; eye large, 2.3–2.5 in the head; interorbital 3 in the head.

Compressed; depth of head at the base of the occipital process 1.33 to 1.5 in the greatest depth. Preventral region rounded, with complete median series of 10 or 11 scales. Predorsal region rounded, with complete median series of 9 scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2.5 scales on the side. Interorbital region almost flat. Frontal fontanel triangular to truncate triangular, equal to the length of the parietal without the occipital groove. Second suborbital leaving a very narrow naked margin behind and below. Snout short, mouth large. Maxillary and mandible both long and equal to the eye. Premaxillary with 5 teeth in the inner row, four large, 4- to 5-pointed, and one very small; three small tricuspid teeth in the outer row. Maxillary with two or three small conical or tricuspid teeth. Dentary with a graduated series of four large, 5-pointed teeth, one very small tooth and twelve or more minute conical teeth on the sides.

Gill-rakers 7 + 9.

Anal sheath short, consisting of 4 scales covering the bases of the first 5 rays. Lateral line with pores on 7 to 16 scales.

Origin of the dorsal very slightly nearer the snout than the caudal, penul-

imate ray 2.5 in the longest, which is about 3.5–3.25 in the length. Origin of the anal on the vertical from the eighth or last dorsal rays. Anal emarginate, its longest ray 1.25 in the base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals reaching to the fifth anal ray. Pectorals often reaching a little beyond the base of the ventrals.

Fins all hyaline; humeral spot small, dark and surrounded by a ring of light, an inconspicuous silvery lateral stripe, widest at the vertical from the adipose, not reaching the caudal spot and subtended by a faint, slaty gray line; caudal spot almost as wide as the caudal peduncle, terminating abruptly before and more gradually behind, not, however, extending to the tips of the middle caudal rays. Sometimes a little black near the tips of the first anal rays. Scales of back and upper part of the sides broadly outlined with dusky. Scales below the lateral stripe with pale bluish and greenish iridescence.

## 20. HEMIGRAMMUS LUNATUS Durbin.

*Hemigrammus lunatus* DURBIN MS. EIGENMANN, Princeton univ. exped. Patagonia, 1910, **3**, p. 436 (Amazon); ELLIS, Ann. Carnegie mus., 1911, **8**, p. 162 (Caceres; Jaurú; Rio Boa Vista).

HABITAT.—Amazon Basin.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20964 Type	1	33		
20964 Paratypes	3	27–32		
20840 Paratype	1	32	Obidos	
3081 C.	5	24–45	Caceres	Haseman
2942 C.	2	46, 48	Jauru	Haseman

Head 3. to 3.2; depth 2.75; D. 11; A. 23 to 26; scales 5–33 to 34–3.5; eye 2.25 in the head, interorbital not quite equal to the eye, 2.5 to 3 in the head.

Very compressed; depth of head at the base of the occipital process about 1.5 in the greatest depth. Preventral region rounded, with a complete median series of 10 or 11 scales. Predorsal region narrowly rounded, with a complete median series of 10 scales.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital slightly convex. Frontal fontanel triangular, very nearly as wide as the parietal, equal to the parietal without the occipital groove. Second suborbital moderately wide, leaving a very narrow naked margin behind but sometimes none below. Snout short, mouth large. Maxil-



lary three fourths of the eye, about 3.25 in the head. Mandible equal to the eye. Premaxillary with four broad, tricuspid teeth in the outer row, and five 3- to 5-pointed teeth in the inner row. Maxillary with two or three conical or tricuspid teeth. Dentary with a series of four large, 5-pointed teeth followed by seven to ten small, conical or notched ones on the sides.

Gill-rakers about 6 + 11.

Anal sheath short, of about 5 scales covering the bases of the first 8 anal rays. Lateral line with pores developed on the first 10 or 11 scales.

Origin of the dorsal equidistant from the snout and caudal, the penultimate ray two fifths of the longest, which is 3 in the length. Origin of the anal on the vertical from the last dorsal ray. Anal falcate, the longest ray almost equal to the base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals reaching to the third anal ray. Pectorals reaching the second scale beyond the base of the ventrals.

Humeral spot small, semicircular, the curved margin directed upwards always very faint and often lacking. No caudal spot. Lateral stripe a narrow, dark line overlaid with silvery. All the fins hyaline. A few chromatophores at the base of each anal ray. Sides below the lateral stripe faintly iridescent.

Two specimens, 45 and 48 mm. Rio Boa Ventura, (2943 c. m.) differ from the typical specimens of *H. lunatus* as follows:—the maxillary with two or three broad, 3-, 5- and 7-pointed teeth. Humeral spot very diffuse, lateral stripe not overlaid with silvery.

## 21. HEMIGRAMMUS MICROSTOMUS Durbin.

*Hemigrammus microstomus* DURBIN MS. EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436 (Amazon); ELLIS, Ann. Carnegie mus., 1911, **8**, p. 163 (Santarem).

HABITAT.—Amazon.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20782 Type	1	28	Santarem	Bourget
20782 } 20783 }	19	23-30	Santarem	Bourget
20840 Paratypes	5	30-37	Obidos	James
20970	1	34	Cudajas	Thayer, Bourget
2944 C.	7	29-34	Santarem	Haseman

Head 3.6 to 4; depth 2.8 to 3.5; D. 11; A. 19 to 22; scales 5-31 to 34-3; eye 2.25 in the head; interorbital about equal to the eye, 2.3.

Compressed; depth of head at the base of the occipital process about 1.66 in the greatest depth. Dorsal profile only slightly arched. Preventral region rounded, without a complete series of median scales. Predorsal region rounded, often with a complete series of 9 to 11 median scales.

Occipital process 5 in the distance from its base to the dorsal. Interorbital very slightly convex. Frontal fontanel triangular, as wide as the parietal, three fourths the parietal without the occipital groove. Second suborbital narrow, leaving a narrow naked margin behind and below. Snout short, mouth very small. Lower jaw scarcely projecting beyond upper, even when the mouth is open. Maxillary convex in front, little more than half the eye, 3.5 in the head. Mandible equal to the eye. Premaxillary with two or three, 5-pointed teeth in the outer row, and four or five 5- to 7-pointed teeth in the inner row. Maxillary with two or three 4- to 7-pointed teeth. Dentary with five broad, 5- to 7-pointed teeth, followed by a series of several small teeth on the sides.

Gill-rakers 6 + 7.

Caudal scaled over the basal half. Anal sheath short, of about 3 scales, covering the base of first 5 or 6 rays. Pores developed on the first 7 to 9 scales of the lateral line.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray two fifths of the longest, which is 3.25 in the length. Caudal about one third the length of the eye longer than the head. Origin of the anal on the vertical from the second scale behind the dorsal. Anal almost falcate, the longest ray about 1.2 in the length of the anal base. Ventrals on the vertical from the first dorsal rays or the first scale in front of the dorsal. Ventrals just reaching the anal. Pectorals reaching the first scale in front of the ventrals.

No caudal spot, humeral spot small and round, usually faint and often lacking. A narrow, blackish, lateral stripe overlaid with silvery, from the base of the caudal to the humeral spot, if the humeral spot is present. Fins all hyaline. Scales of the back outlined with dusky. Bluish and greenish iridescence on the sides and cheeks.

## 22. HEMIGRAMMUS ORTHUS Durbin.

Plate 21, fig. 1.

*Hemigrammus orthus* DURBIN, Ann. Carnegie mus., 1909, 6, p. 61 (Tukeit); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 143; Mem. Carnegie mus., 1912, 5, p. 336, pl. 48, fig. 5; ELLIS, Ann. Carnegie mus., 1911, 8, p. 163 (Santarem).

HABITAT.—British Guiana; Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1477 C. Type	1	28	Tukeit	Eigenmann
1478 C., 11912 I.	17	22–30	Tukeit	Eigenmann
Paratypes				
1479 C., 11922 I.	25	14–21	Gluck Island	Eigenmann
Paratypes				
1480 C. Paratype	1	27	Essequibo below Packeoo	
3600 C.	6	25–34	Hubabu Creek	Ellis
2945 C.	5	26–31	Santarem	Haseman
2948 C.	5	19–21	Konawaruk	Eigenmann

Head 3.75; depth 3.75; D. 11; A. 19 to 22; scales 5–30 to 33–3; eye 2.5 in the head; interorbital not quite equal to the eye, about 3 in the head.

Compressed; depth of head at the base of the occipital process about 1.33 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, probably with a complete series of 9 median scales.

Occipital process about 6 in the distance from its base to the dorsal, bordered by 2 or 3 scales on the sides. Interorbital slightly convex. Frontal fontanel triangular, narrower than the parietal and not quite equal to the parietal without the occipital groove. Second suborbital leaving narrow naked margins behind and below. Snout a little more than one half the length of the eye. Mouth large. Maxillary equal to the eye, narrow, slightly curved backwards, the two sides parallel to each other. Mandible equal to the maxillary. Pre-maxillary with three tricuspid or conical teeth in the outer row, and five, 3- to 5- or rarely 7-pointed teeth in the inner row. Maxillary with one to five tricuspid or conical teeth. Dentary with a graduated series of four or five large 3- to 5-pointed teeth.

Gill-rakers 7 + 14.

Caudal with 3 to 5 scales on the base of each lobe. Anal sheath short, of 3 scales covering the base of the first 6 anal rays. Lateral line with pores developed on about 7 scales.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray one third of the longest which is 3.5 in the length. Origin of the anal on the vertical from last dorsal ray. Anal deeply emarginate, the longest ray about 1.25 in the base. Base of ventrals on the vertical from the second scale in front of the dorsal. Ventrals just reaching anal. Pectorals just reaching ventrals.

A diffuse, round or somewhat vertically elongate, humeral spot. A dark lateral stripe, heaviest behind the origin of the anal, but not reaching the base of the caudal. No caudal spot. A black line at the base of the last anal rays not continuous with that at the base of the first seven. Dorsal, caudal, first seven rays of the anal, and first two or three rays of ventrals dusky. Scales of the back dusky, each often bearing a single black spot.

### 23. *HEMIGRAMMUS CUPREUS* Durbin.

Plate 20, fig. 3.

*Hemigrammus cupreus* DURBIN MS. EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436 (Amazon).

HABITAT.—Amazon.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20952 Cotypes	11	42-53	Jatuarana	Navez
21069 Cotypes	6	32-35	Silva, Lake Saraca	Thayer

Head 4; depth 3-3.75; D. 11; A. 20-22; scales 5 to 7-30 to 33-3 or 3.25; eye 2.9 in head; snout 1.25 in the eye; interorbital slightly less than the eye, 3 in head.

Compressed; depth of head at the base of the occipital process 1.25 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete series of 9 median scales.

Occipital process 6 in the distance from its base to the origin of the dorsal, bordered by 3 scales. Interorbital convex. Frontal fontanel narrower than the parietal, triangular, one half the parietal without the occipital groove. Second suborbital having a narrow naked margin below but not behind. Snout moderately long; mouth large; lower jaw protruding beyond the snout when

mouth is open. Maxillary 1.33 in the eye, much arched in front. Mandible longer than eye, 2.25 in head. Premaxillary with five to seven narrow, tricuspid teeth in the inner row, and two to three conical teeth in the outer row. Maxillary with three to five conical and tricuspid teeth. Dentary with a graduated series of five to seven tricuspid teeth, grading into a series of several minute conical teeth on the side.

Gill-rakers 6 + 10.

Anal sheath of 2 or 3 scales covering the bases of the first 7 to 9 anal rays. Lateral line with pores on 8 to 10 scales.

Origin of the dorsal equidistant between snout and caudal, penultimate ray one third of longest which is 3.75 in the length. Origin of anal on the vertical from the second scale behind the dorsal. Anal emarginate, longest ray a little longer than the base. Caudal the length of the eye longer than the head, slightly less than the basal half scaled. Ventrals on the vertical from the origin of the dorsal. Ventrals barely reaching the anal, pectorals not usually reaching the ventrals in specimens over 43 mm. long.

A faint, vertically elongate humeral spot, a slender black lateral stripe not reaching the caudal but overlaid with a silvery iridescent stripe which does extend to the caudal. The outer and sometimes the extreme tips of middle caudal rays slightly pigmented. The scales of the back and bases of the anal rays faintly outlined with brownish. A few chromatophores scattered over the dorsal and first anal rays. Iridescence on scales below the lateral stripe shading from rich copper on caudal peduncle to pale bluish on the lower series. No caudal spot.

#### 24. HEMIGRAMMUS CYLINDRICUS Durbin.

Plate 22, fig. 5.

*Hemigrammus cylindricus* DURBIN, Ann. Carnegie mus., 1909, 6, p. 62 (Tumatumari); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 426; Mem. Carnegie mus., 1912, 5, p. 337, pl. 49, fig. 3.

HABITAT.—British Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1461 C. Type	1	57	Tumatumari	Eigenmann
1462 C., 11915 I.	6	35-58	Tumatumari	Eigenmann
Paratypes				
1163 C., 11916 I.	11	46-54	Crab Falls	Eigenmann
Paratypes				

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1464 C., 11917 I.	20		Rockstone	Eigenmann
Paratypes				
1465 C. Paratype	1	45	Gluck Island	Eigenmann
	54	45-108	Gluck Island	Gimbel Exped.

Head 3.3-3.66; depth 3.66-4.66; D. 11; A. 17 to 20; scales 5-30 to 34-3; eye large, slightly longer than wide, 2.75 in the head; interorbital almost flat, almost equal to the eye, 3 in the head.

Subeylindrical, or only slightly compressed; depth of head at the base of occipital process 1.25 to 1.5 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with a complete median series of 8 to 12 scales.

Occipital process about 6 in the distance from its base to the dorsal, bordered by 2 or 3 scales. Interorbital nearly flat. Frontal fontanel small, triangular, narrower than the parietal; two thirds the parietal without the occipital groove. Second suborbital leaving considerable naked margins behind and below. Maxillary straight, 1.25 in the length of the eye. Mandible a little longer than the eye, 2.5 in the head. Premaxillary with three or four tricuspid teeth in the outer row, and six tricuspid teeth in the inner row. Maxillary with three to six tricuspid, or occasionally conical teeth. Dentary with a graduated series of four or five teeth also tricuspid.

Gill-rakers 6 + 9.

Caudal scaled over halfway to the end of the lobes. Anal sheath short, consisting of the edge of 3 large scales. Lateral line with pores developed on 7 to 12 scales.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray one third the longest, which is 4 in the length. Origin of the anal on the vertical from the third scale behind the dorsal. Anal very deeply emarginate, the longest ray just reaching the base of the last ray. Ventrals on the vertical from the origin of the dorsal. Ventrals, just barely or not quite, reaching the anal, pectorals reaching the second scale in front of the ventrals.

Humeral spot small, roundish or roughly triangular, often intense. A black line at the base of the anal. A narrow black lateral stripe. No true caudal spot, sometimes a dusky spot at the base of each caudal lobe. Each scale of the back often with a single intense dark spot. Scales of the sides often outlined with dusky. Scales of all except the upper three series with

iridescence, the last few on the end and middle of the caudal peduncle rich copper. In life adipose yellow and dorsal yellowish.

## 25. HEMIGRAMMUS ANALIS Durbin.

Plate 22, fig. 2.

*Hemigrammus analis* DURBIN, Ann. Carnegie mus., 1909, **6**, p. 64 (Rockstone); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436; ELLIS, Ann. Carnegie mus., 1911, **8**, p. 163 (Santarem); EIGENMANN, Mem. Carnegie mus., 1912, **5**, p. 337, pl. 49, fig. 6.

HABITAT.—British Guiana.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1466 C. Type	1	35	Rockstone	Eigenmann
1468 C., 11919 I. Paratypes	21	24–29	Gluck Island	Eigenmann
1467 C., 11918 I. Paratypes	72	19–36	Rockstone	Eigenmann
1469 C., 11920 I. Paratypes	2	29, 35	Wismar	Eigenmann
	1	30	Santarem	Haseman

Head 3.5–3.75; depth 3.25–3.50; D. 11; A. 12–14; scales 5–30 to 32–3; eye 2.33 in head, snout 1.5 in the eye, interorbital less than the eye, about 2.75 in the head.

Compressed; depth of head at base of occipital process 1.33 in the greatest depth. Preventral region rounded, without regular series of median scales. Predorsal region rounded, having a regular median series of 8 scales.

Occipital process 5 in the distance from its base to the origin of the dorsal, bordered by 2 or 3 scales. Interorbital flat. Frontal fontanel small, triangular, narrower than the parietal, half the length of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin below and behind. Snout short. Mouth large. Maxillary not so long as the eye. Mandible equal to the eye. Premaxillary with three or four 5-pointed teeth in the outer row, and five, 5- to 7-pointed teeth in the inner row. Maxillary with two or three 6- to 7-pointed chisel-shaped teeth. Dentary with four broad, 7-pointed teeth, followed by three or four minute teeth on the sides.

Gill-rakers about 6 + 9.

Caudal scaled halfway to the end of the longest rays. Anal sheath of 3

or 4 normal scales which extend over the bases of the first 7 or 8 rays. Pores developed on 7 or 8 scales.

Origin of the dorsal about equidistant from the snout and caudal, the penultimate ray 0.4 of the longest which is 3.67 in the length. Origin of the anal on the vertical from the second scale behind the dorsal; anal emarginate, longest ray equal to the base. Caudal half the length of the eye longer than the head. Ventrals on the vertical from the first dorsal ray; ventrals just reaching the anal. Pectorals not reaching the ventrals.

Humeral spot distinct but not heavy, not conspicuously elongated. Lateral stripe the width of one scale, not so intense as the humeral spot, expanded on the caudal peduncle, but not extending on the fin; scales overlying the lateral stripe distinctly silvery. No caudal spot. First five anal rays, the caudal and all of the dorsal dusky. Each median dorsal scale with a roundish dark spot. Scales of the upper half of the sides outlined with dusky. A few chromatophores scattered about the base of the anal and aggregated so as to form a small dark spot or line on the ventral side of the caudal peduncle. Top of the head dark. The lateral stripe probably red in life.

The single specimen from Santarem resembles very closely *H. analis*, and has 13 anal rays, but the maxillary has but one tricuspid tooth which is not typical.

#### 10. HYPHESSOBRYCON Durbin.

*ὑψησσωρ* = smaller, *βρυχω* = to gnash the teeth, from which Brycon a genus of Characins.

*Hyphessobrycon* DURBIN, Bull. M. C. Z., 1908, 52, p. 100 (*compressus*).

*Dermatocheir* DURBIN, Ann. Carnegie Mus., 1909, 6, p. 55, (*catablepta*).

TYPE.—*Hemigrammus compressus* Meek.

Like *Hemigrammus* but with the caudal naked.

The genus *Dermatocheir* was based on a specimen with arrested pectoral development. Several other species have since been discovered with similar pectorals, but otherwise showing the characters of this and of other, quite distinct genera.

HABITAT.—Mexico to the La Plata, Pacific Slope of Ecuador.

#### *Key to the Species.*

- a.* Scales 45–48, no lateral band, no caudal or humeral spots. D. 11; A. 25–27; scales 8–45 to 48–7.
- b.* Dorsal with a conspicuous spot on basal half of anterior rays; maxillary equals eye.
  - 1. *compressus* (Meek).
- bb.* Dorsal dark; anal mostly dark; maxillary less than eye; everywhere densely peppered with chromatophores.
  - 2. *milleri* (Durbin).



- aa. Scales not more than 36.
- c. Dorsal black or with a well-defined black spot. (See also *melanopleura*).
- d. Humeral spot present, anal unmarked with black or with black only on the tips of the rays.
- e. Dorsal black, a deep humeral spot, last five anal rays and distal two fifths of remaining anal rays black. D. 11; A. 27 to 30; scales 6 to 7.5-31 to 33-3.5. Maxillary with two tricuspid teeth. . . . . 3. *callistus* (Boulenger).
- ce. Basal part of dorsal not black.
- f. Maxillary with two or three teeth; inner row of premaxillary of five teeth.
- g. Maxillary teeth tricuspid; last few and frequently the first few anal rays with black on or near the tips.
- h. Humeral spot very small, black on anal subtended with white; depth 3.8; head at base of occipital process 1.33 in. the greatest depth; D. 11; A. 26; scales 5-32 to 34-3. . . . . 4. *minor* Durbin.
- hh. Humeral spot vertically elongate, anal rays often tipped with black; depth 2.75; head at the base of occipital process 1.5 in the greatest depth; D. 11; A. 25-27; scales 5-29 to 31-3.5. . . . . 5. *serpac* Durbin.
- gg. Maxillary teeth with 6 to 8 cusps, broad, set obliquely, overlapping; anal usually not black tipped. D. 11; A. 28; scales 5 to 7-24 to 27-3.5. . . . 6. *coplandi* Durbin.
- ff. Maxillary with about six, tricuspid or conical teeth; eight tricuspid teeth in the inner row of the premaxillary; base of caudal hyaline; lower fins dusky, ventrals sometimes reaching the fifth anal ray. D. 11; A. 27 to 30; scales about 30 to 33. . . . . 7. *bentosi* Durbin.
- dd. No humeral or caudal spot.
- i. The black dorsal spot margined with white above. Maxillary with four to six tricuspid or conical teeth. D. 11; A. 26 or 27; scales 5-31 to 33-3. . . . . 8. *rosaceus* Durbin.
- ii. Maxillary without teeth; D. 11; A. 22; scales 5-34-3. . . . 9. *hasemani* Fowler.
- cc. Dorsal plain.
- j. No humeral spot.
- k. Caudal spot lacking or faint; premaxillary with five teeth in the inner row.
- l. Fourteen scales in a vertical series; caudal spot entirely lacking, much compressed. Sides thickly peppered with small inconspicuous chromatophores. Maxillary with three conical or tricuspid teeth: D. 11; A. 25; 7-24 to 36-6. . . . . 10. *panamensis* Durbin.
- ll. Nine scales in a vertical series; caudal sometimes plain, with a faint spot. Maxillary with two minute teeth. Eye 2 to 2.5 in the head. D. 10 or 11; A. 17 to 24; scales 5-29 to 34-3.5 to 4. . . . . 11. *gracilis* (Reinhardt).
- kk. A small spot at the base of each caudal lobe; a row of spots along the base of the anal. Four to six small teeth in the maxillary. Ten to twelve, conical or tricuspid teeth in the second row of the premaxillary. D. 10 or 11; A. 19 or 20 scales 4 or 5-32 to 34-3.5. . . . . 12. *riddlei* (Meek).
- kkk. Caudal spot well developed, single.
- m. Maxillary without teeth, premaxillary with nine tricuspid teeth in the inner row. Lateral stripe silvery, no black; caudal spot confined to the peduncle. D. 10; A. 27; scales 5-32-3. . . . . 13. *stramineus* Durbin.
- mm. Maxillary without teeth, very short. Premaxillary with five broad 5- to 7-pointed teeth. Caudal spot continued forward as a heavy lateral stripe, often reaching the head. D. 11; A. 14 to 16; scales 5 or 6-32 to 36-4 or 5. . . . . 14. *taurocephalus* Ellis.
- mmm. Maxillary with or without one small conical tooth. Premaxillary with five 3-pointed teeth in the inner row. Caudal spot condensed or diffuse. D. 11; A. 20 or 21; scales 5-32 to 34-3 or 4. . . . . 15. *parvellus* Ellis.
- mmmm. Maxillary with two or three broad, 5- to 7-pointed teeth; premaxillary with five, 5- to 7-pointed teeth in the inner row. A black lateral stripe somewhat diffused in the humeral region, caudal spot continued on the middle rays but not to their end. D. 11; A. 16 or 17; scales 5-30 to 33-3. . . . . 16. *minimus* Durbin.

*mmmm.* Teeth strong, simply conic or tricuspid, and in the latter case of large size; maxillary with three cusps. Caudal spot continued on the middle rays but not to their tip. D. 11; A. 19; scales 33.

17. *stigmatias* Fowler.

*jj.* Humeral and caudal spot both developed. (See also *minimus* and *pocilloides*).

*n.* Fourteen or more scales in a vertical series, dorsal profile very convex. Maxillary with five small stout teeth. Humeral spot oval, not surrounded by a bright border. D. 11; A. 27; scales 7-35-6.

18. *robustus* Cope.

*nn.* Less than fourteen scales in a vertical series.

*o.* Lower part of caudal peduncle dark, the upper part of the peduncle light; second suborbital broad, in contact or nearly in contact with the preopercular limb.

*p.* Third anal ray extending to the base of the last ray. The dark spot on the caudal peduncle diffuse, covering little more than the lower half of peduncle; the part above the spot iridescent; maxillary with one to three, 3- to 5-pointed teeth; humeral spot obscure, round. D. 11; A. 22; scales 5-34-35.

19. *melazonatus* Durbin.

*pp.* Third anal ray not extending to the base of the last ray. Entire lower two thirds of caudal peduncle very black, no iridescence on the peduncle; humeral spot obscure much elongated vertically. Maxillary with five to seven very narrow conical and tricuspid teeth. D. 11; A. 17 to 20; scales 6-33 to 34-4.

20. *cos* Durbin.

*oo.* Caudal peduncle symmetrically marked; second suborbital leaving a considerable naked area on the cheek.

*q.* Caudal spot not continued forward, not continued on the middle caudal ray; humeral spot faint. Maxillary much shorter than the eye, with one broad 7- or 8-pointed tooth. Lateral line often interrupted, complete or incomplete. D. 11; A. 24 to 26; scales 6-32 or 33-4.5 to 5.5.

21. *inconstans* (Eigenmann).

*qq.* Caudal spot continued forward and backward usually to the tip of the middle caudal rays.

*r.* Second suborbital leaving a naked margin behind and below.

*s.* Anal rays 20 to 22. (See also *lütkeni*). Humeral spot obscure; maxillary with two, 3- to 5-pointed teeth. Depth 3; head 3.6; D. 11; scales 5-32-4.

22. *santae* (Eigenmann).

*ss.* A. 19-23. Humeral spot obscure; maxillary with two small tricuspid and one conical tooth. Depth 3.5-4 equal to the head; scales 5-6 + 24-4.

23. *metae* Eigenmann and Henn.

*sss.* A. 23. Maxillary without teeth; mouth large; D. 12; scales 5-34-3. Middle caudal rays dark, a dark lateral band, no distinct caudal spot.

24. *agulha* Fowler.

*ssss.* Anal ray 20 to 26.

*t.* Maxillary with one tricuspid tooth; mouth large. Humeral spot often obscure; lower lobe of the caudal hyaline; distal third of the anal dusky. D. 11; A. 22-26; scales 6-33 to 36-5 or 6.

25. *avisitsi* (Eigenmann).

*tt.* Maxillary with two, 7- to 10-pointed teeth. Humeral spot distinct, vertically elongate, margined in front and behind with light. Caudal spot not always reaching the end of middle caudal rays. Depth 2.3 to 2.6; head 3.7 to 4.4; D. 11; A. 20 to 26; scales 5 or 6-30 to 35-4 or 5. . . . . 26. *lütkeni* (Boulenger).

- rr. Second suborbital in contact with the preopercle.
- u. Large caudal spot; humeral spot intense; lateral stripe black, linear, most intense over the middle of the anal, disappearing below the origin of the dorsal, and becoming very faint before it reaches the caudal spot. Lateral line with pores on 5 to 7 scales. Maxillary with one small 3- to 5-pointed tooth. D. 11; A. 18 to 21; scales 6 to 7-31 to 34-4 or 5. . . . 27. *reticulatus* Ellis.
- uu. Intense caudal spot; humeral spot dim and vertically elongate. Lateral stripe plainly continuous with the caudal spot. Caudal spot continued to the end of the middle caudal rays. Eye small, 3 to 3.5, interorbital 2.8-3 in the head. D. 11; A. 16 to 18; scales 5 or 6-36-4 or 5. . . . 28. *duragenys* Ellis.
- uuu. No caudal spot. Humeral spot faint and vertically elongate. Lateral stripe broad, continued to the end of the middle caudal rays. Eye small 4, interorbital 2-2.6 in the head. D. 11; A. 16-18; lateral line 36. . . . 29. *pocilloides* Eigenmann.
- ii. No caudal spot, humeral spot developed, cheek partly naked. (See also *pocilloides*).
- v. Humeral spot not continued backwards.
- w. Humeral spot much nearer to the posterior margin of the eye than the dorsal.
- x. A black line along the middle of the sides. Maxillary with one or more, usually two, conical or 3-pointed teeth. Humeral spot round or oval. Mouth large; D. 11; A. 22-26; scales 5-31 to 33-3 to 3.5. . . . 30. *bellottii* (Steindachner).
- xx. Two vertical humeral spots, a series of v-shaped lines along the middle of the sides. Young uniformly dotted. Maxillary with one moderately large 3- to 5-pointed tooth. D. 11; A. 29 to 32; scales 6 or 7-33 to 36-5 or 6. . . . 31. *bifasciatus* Ellis.
- xxx. Humeral spot very faint; maxillary with seven small conical teeth. A. 20; scales 5-33-3. . . . 32. *catableptus* (Durbin).
- ww. Humeral spot round, with vertical elongations, equidistant from the posterior margin of the eye and the base of the first dorsal ray; mouth only moderately large. Maxillary with three broad, 4- to 7-pointed teeth. D. 11; A. 26 to 31; scales 6-33-4. . . . 33. *stictus* Durbin.
- www. Humeral spot vertical, conspicuous; maxillary with 0-3 minute teeth; A. 22-24; scales. . . . 34. *ecuadoriensis* Eigenmann and Henn.
- vv. Humeral spot not separable from the conspicuous lateral band.
- y. Lateral band bordered above with silvery. First six anal rays elongate. Maxillary, with four conical teeth. Origin of the anal under the last dorsal ray. D. 11; A. 20-23; scales 5-32 to 34-8. Eye 2.5 in the head. . . . 35. *heterorhabdus* (Ulrey).

yy. Lateral band not bordered above with silvery. Origin of the anal on the vertical from the third dorsal ray. D. 11; A. 26 to 28; scales 6 or 7-30 to 36-5.  
36. *melanopleurus* Ellis.

# 1. HYPHESSOBRYCON COMPRESSUS (Meek).

Plate 24, fig. 1; Plate 79, fig. 14.

*Hemigrammus compressus* MEEK, Field Columbian mus. Publication, 1904, Zool. ser. 5, p. 87 (El Hule, Oaxaca in basin of Papalvani).

*Hyphessobrycon compressus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Mexico.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10798, 11126 I.	7	36-42	Obispo, Vera Cruz, Mex.	Meek
10929 I.	1	44	Perez, Mex.	Meek

Head 3.5-3.7; depth 2.5-2.7; D. 11; A. 25-27; scales 8-45 to 48-7; eye 2.5 or a little more in the head; interorbital 3 to 3.5 in the head, much less than the eye.

Compressed, comparatively deep: depth of head at the base of the occipital process 1.75 in the greatest depth. Preventral region rounded, without regular median series of scales. Predorsal region slightly keeled, a regular series of about 18 narrow median scales.

Occipital process 5 in the distance between its base and the dorsal, bordered by about 5 scales. Interorbital very slightly convex. Frontal fontanel triangular, narrower than and almost as long as the parietal without the occipital groove. Second suborbital small, leaving a naked area behind and below as wide as the bone. Maxillary equal to the eye; mandible 1.25 to 1.3 times the eye. Snout short, 2 in the length of the eye. Mouth large; premaxillary with five tricuspid teeth in the inner, and two or three tricuspid teeth in the outer row; the two rows close together. Maxillary with four to seven conical or tricuspid teeth placed far apart. Dentary with a graduated series of five tricuspid teeth followed by a series of minute conical ones on the sides of the jaw.

Gill-rakers 12 + 7, the longest nearly half the length of the eye.

Scales small and narrow. Imbrication usually regular, in one instance a row of scales dropped out above the middle of the ventrals. Anal sheath short, consisting of 5 to 8 scales, and covering the base of the first 5 or 6 rays. Lateral line developed on 6 scales.

Origin of the dorsal nearly the length of the eye nearer to the caudal than to the snout, the penultimate ray 2.5 in the longest which is 4 in the length. Anal origin on the vertical from the fifth or sixth dorsal ray. Anal emarginate. Caudal equal to the head in length. Ventrals on the vertical half the length of the dorsal basis in front of origin of dorsal. Ventrals reaching the base of the fifth anal ray; pectorals reaching to third scale beyond origin of the ventrals.

A triangular black spot covering all but the extreme base of the proximal half of the anterior six or seven dorsal rays, widest anteriorly. Membranes especially at the tip of anal with numerous chromatophores, chromatophores scattered sparingly over all the fins and sides excepting the part over the body-cavity. No humeral or caudal spot. Preopercle with some silvery iridescence.

## 2. *HYPHESSOBRYCON MILLERI* Durbin.

### Plate 24, fig. 2.

*Hemigrammus compressus* MILLER, Bull. Amer. mus. nat. hist., 1907, **23**, p. 101 (Los Amates).

*Hyphessobrycon compressus milleri* DURBIN, Bull. M. C. Z., 1908, **52**, p. 100; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436.

HABITAT.—Guatemala.

One specimen 11255 I. Type      40 mm.      Los Amates, Guatemala      Miller

Very closely related to *H. compressus* from which it may be distinguished by having the entire dorsal dark. Anal membranes except, in the anal lobe, black. Opercle deeply incised behind, maxillary less than the eye; naked margin around the second suborbital not more than half the width of the bone.

Head 3.25; depth 2.5; D. 11; A. 25; scales 8–45 to 48–7, eye 3 in the head, interorbital equal to the eye, 3 in the head.

Like *H. compressus* in shape and scaling of preventral, postventral, and predorsal regions, relative length and size of occipital process, frontal, and parietal fontanels. Interorbital slightly more convex. Second suborbital small, about half as wide as the eye, but more than twice as wide as its naked margins. Opercle deeply incised behind. Maxillary shorter than the eye; mandible 1.2 times the eye. Snout a little less than half the eye. Teeth as in *H. compressus*.

Gill-rakers 9 + 10, slender, serrate on one side only.

Scales not different from those of *H. compressus*, except that the lateral line is very slightly decurved.

Origin of the dorsal as in the related species but origin of the anal on the vertical from the third instead of the fifth dorsal ray.

Entire dorsal dark, anal web, except in the anal lobe, black; some large black chromatophores on the anal rays. The sides everywhere thickly peppered with conspicuous chromatophores; especially dusky about the origins of the anal and ventrals. The scales in the upper half of the region above the anal more or less distinctly outlined. Preopercle and second suborbital with brassy reflections which are less evident on the scales of the body.

### 3. *HYPHESSOBRYCON CALLISTUS* (Boulenger).

Plate 24, fig. 3; Plate 79, fig. 13.

*Tetragonopterus callistus* BOULENGER, Boll. Mus. univ. Torino, 1900, 15, no. 370, p. 2 (Carandosinho, Matto Grosso).

*Hemigrammus melanopterus* EIGENMANN and KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 518 (Arroyos Trementina and Pypucu, Paraguay).

*HypheSSobrycon callistus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; ELLIS, Ann. Carnegie mus., 1911, 8, p. 158.

HABITAT.—Paraguay Basin in Matto Grosso and Paraguay.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10039 I. <sup>1</sup>	1	33 (about)	Arroyo Trementina	Anisits
10040 I. <sup>2</sup>	1	33 (about)	Arroyo Pypucu	Anisits
10041 <sup>2</sup>	1	28 (about)	Arroyo Pypucu	Anisits
3039 C.	8	26-38	Caceres	Haseman
3040 C.	14	33-38	Puerto Suarez	Haseman
3037 C.	4	31-39 (about)	Corumba	Haseman
3038 C.	6	25-38 (about)	Jauru	Haseman

Head 3.2-3.6; depth 2.33-3; D. 10 or 11; A. 27 to 30; scales 6 to 7.5-5 + 31 to 33-3.5; eye 2.25 to 2.66 in head, interorbital 3.5 in the head.

Compressed, deep; depth of head at the base of the occipital process 2, or little less, in the greatest depth. Dorsal profile much arched to the origin of the dorsal. Dorsal base steeply inclined toward the caudal. Preventral region rounded, no regular median series of scales. Predorsal region rounded, with a regular median series of 11 scales.

<sup>1</sup> Type of *H. melanopterus* Eigenmann & Kennedy.

<sup>2</sup> Paratypes of *H. melanopterus* Eigenmann & Kennedy.

Occipital process 4 to 5 in the distance from its base to the dorsal; bordered by two and five tenths to three scales. Interorbital almost flat. Frontal fontanel much narrower than the parietal, two thirds as long as the parietal without the occipital groove. Second suborbital broad, in contact with the preopercle at its middle and below, leaving a narrow naked margin behind it, third suborbital narrow, inconspicuous. Mouth small; snout short. Maxillary shorter than the eye, mandible a little longer. Premaxillary with five, 3- and 4-pointed teeth in the inner row; two tricuspid teeth in the outer row. Maxillary with two or three small tricuspid teeth placed close together. Dentary with a graduated series of five large 3- to 5-pointed teeth followed by five or six minute conical ones on the sides.

Gill-rakers 7 + 11.

Anal sheath short, of about 6 scales, covering the bases of the first 5 rays. Lateral line developed on 5 scales.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray 2 in the longest ray, which is 3.5 in the length. Origin of the anal on the vertical from the fifth or sixth dorsal rays. Anal long and wide, the rays of nearly the same length throughout. Origin of ventrals on the vertical from the third or fourth scale in front of the dorsal. Ventrals reaching to or beyond the origin of the anal, pectoral barely reaching the ventrals.

Entire dorsal black, with never more than the narrow base and extreme tips of rays whitish. One half to one fifth of the anterior seven anal rays, the tips of all the middle ones and almost the entire last five rays black. A heavy black vertically elongate humeral spot crossing the fourth, fifth, and sixth scales of the lateral line series. No caudal spot. Scales of the dorsal surface outlined with dusky.

In the type of *H. melanopterus* the ventrals reach considerably beyond the origin of the anal, and the anal is more conspicuously marked with black than in the other specimens.

#### 4. HYPHESSOBRYCON MINOR Durbin.

Plate 22, fig. 3.

*Hyphessobrycon minor* DURBIN, Ann. Carnegie mus., 1909, 6, p. 65 (British Guiana); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus. 1912, 5, p. 339, pl. 49, fig. 5.

HABITAT.—British Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1189 C. Type	1	19	Konawaruk	Eigenmann
11767 I. Paratypes	2	21-25	Konawaruk	Eigenmann
3075 C.	1	25	Demerara river	Eigenmann

Head 3.5; depth 3.8; D.11; A. 26 to 28; scales 5-32 to 34-3; eye 2.5 in head; interorbital less than the eye, about 3 in the head.

Compressed; depth of head at base of the occipital process 1.25 in the greatest depth. Preventral region rounded, with complete median series of 10 to 11 scales. Predorsal region rounded, with complete median series of 9 scales.

Occipital process about 5 in the distance from its base to the dorsal, bordered by two scales. Interorbital slightly convex. Frontal fontanel triangular, narrower than the parietal, three fourths the length of the parietal fontanel without the occipital groove. Second suborbital leaving narrow naked margins behind and below, the lower margin being a mere line. Snout short, 1.5 in the length of the eye. Mouth small. Maxillary less than the eye, about 3 in the head; mandible equal to the eye, about 2.5 in the head. Premaxillary with one or two narrow tricuspid teeth in the outer row and five 3- to 5-pointed teeth in the inner row. Maxillary with two or three broad 3- to 5-pointed teeth. Dentary with four or five 3- to 5-pointed teeth in a graduated series, followed by several minute conical or 3-pointed teeth on the sides.

Anal sheath short, of 5 scales covering the base of the first 8 or 9 rays. Lateral line with pores developed on 7 scales.

Origin of the dorsals equidistant from the snout and caudal; penultimate ray little more than one third the longest which is 3.8 in the length. Origin of the anal on the vertical from the fourth dorsal ray. Anal emarginate, the longest ray 2 in the length of the base. Ventrals on the vertical from the first or second scales in front of the dorsal. Ventrals reaching the third anal ray; pectorals reaching just beyond the base of the ventrals.

Humeral spot small, black, vertically elongate. No caudal spot. Lateral stripe extremely narrow and line-like, interrupted and very faint. Scales of the back and upper half of the sides outlined with dusky. Dorsal with an intense black bar on the outer half of the anterior six or seven rays; the tips of the second, third, and fourth rays and a streak directly below the black bar, white. Posterior half of anal rays with blackish tips. Caudal, anal, ventrals, and pectorals a little dusky.



5. *HYPHESSOBRYCON SERPAE* Durbin.

Plate 25, fig. 1; Plate 79, fig. 12, 12a, 12b.

*Hyphessobrycon serpae* DURBIN, Bull. M. C. Z., 1908, 52, p. 100 (Serpa); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; ELLIS, Ann. Carnegie mus., 1911, 8, p. 159.

HABITAT.— Amazon, Rio Guaporé, Upper Paraguay.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20985 Cotypes	46	26-30	Serpa	Thayer
3086 C.	2	27-42	Maciel, Rio Guaporé	Haseman
3087 C.	1	23	Caceres	Haseman

Head 3.5; depth 2.75-3; D. 10 or 11; A. 25-30; scales 5-29 to 31-3.5; eye 2.5-2.75; interorbital 3 in head.

Body compressed, deepest at the origin of the dorsal. Depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded in front, flattish near the ventrals, without a regular series of median scales. Predorsal region rounded, very slightly if at all keeled, with a median series of 10 scales.

Occipital process 5 in the distance from its base to the origin of the dorsal, bordered by 3-3.67 scales. Interorbital slightly convex. Frontal fontanel narrowly triangular, 1.25 in the much wider parietal, without the occipital groove. Second suborbital in contact with the preopercle below, a narrow naked border behind it, second suborbital narrow. Mouth moderately large. Maxillary almost equal to the length of the eye. Mandible a very little longer than the eye. Snout short. Premaxillary with two or three tricuspid teeth in an outer row and five to seven 3- to 4-pointed ones in the inner row. Maxillary with two, sometimes three, small tricuspid teeth. Dentary with a graduated series of five 3- to 5-pointed and five or six minute conical teeth on the side.

Gill-rakers 7 + 16.

Anal sheath short, consisting of 4 or 5 scales covering the bases of the first 8 or 9 anal rays. Pores on 5 or 6 scales of the lateral line.

Origin of dorsal half the width of the eye nearer to the snout than to the base of the caudal, penultimate ray half as long as the longest which is 4 in the

length. Caudal not so long as the head. Origin of anal on the vertical from the 5th to 8th dorsal ray; anal rather narrow. Ventrals just reaching to anal. Pectorals just reaching ventrals.

A round black spot of variable size on the dorsal, bounded above with the white tips of the second and third rays and below by a narrow white bar that is widest on the first ray, coming to a point on the fourth, fifth, or sixth rays. The black may extend over all of the rays or only the first five. A submarginal bar of black on the first anal rays, a marginal black bar on the last rays; occasional specimens have the intermediate rays also tipped with black. A slender narrowly diamond-shaped humeral spot, more distinct on small than on large specimens. No caudal spot. Caudal lobes tipped with dusky. Scales of the back outlined with dusky.

#### 6. *HYPHESSOBRYCON COPELANDI* Durbin.

Plate 25, fig. 2; Plate 79, fig. 11, 11a, 11b.

*HypheSSobrycon copeLandi* DURBIN, Bull. M. C. Z., 1908, **52**, p. 101 (Tabatinga); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436.

HABITAT.—Upper Amazon.

One hundred specimens, 20771 Cotypes      29–42 mm.      Tabatinga      Bourget

Head 3.5 to 3.8; depth 3 to 3.2; D. 11; A. 28; scales 5 to 7–24 to 27–3.5; eye 2.25 to 2.3; interorbital 2.8 to 3 in the head.

Compressed; depth of head at the base of the occipital process 1.33 in the greatest depth. Preventral region flat, a large scale just in front of the ventrals occupying the entire space between them; an irregular median series of 10 scales. Predorsal region narrowly rounded, with complete median series of 8 or 9 scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 2.5 to 3 scales. Interorbital very slightly convex. Frontal fontanel triangular, narrower than and two thirds as long as the parietal, without the occipital groove. Second suborbital leaving a narrow naked margin behind but not below. Maxillary about 1.33 in the length of the eye. Mandible equal to the eye. Snout short. Premaxillary with two or three 3- to 5-pointed teeth near the center of the outer row, the first falling between the first and second teeth of the second series, and the second between the second and third of second series. The inner series of five 5- to 7-pointed teeth. Maxillary

with two or three teeth of from 7 to 9 cusps each. Dentary with a graduated series of about ten teeth, the five in front with 5 to 7 cusps, those on the sides tricuspid.

Gill-rakers about  $6 + 10$ .

Anal sheath represented by 6 scales diminishing in size from the anterior two. Lateral line with pores on 5 to 9 scales.

Origin of the dorsal equidistant from the snout and the last anal ray or tip of the adipose; the penultimate ray almost half as long as the longest, which is 4.16 to 4.25 in the length. Caudal a little longer than the head. First anal ray on the vertical from the fourth to eighth dorsal ray. Ventrals directly below the second scale in front of the dorsal. Pectorals reaching the ventrals.

First six dorsal rays tipped with chalky white their submarginal half covered with a black bar; another bar of chalky white covering one half or two thirds of the remaining distance to the base of the rays; anal usually plain, sometimes tips of the second, third, and fourth anal rays white, a black line passing from just proximal of the white to the tips of fifth and sixth rays. The tips of all the other anal rays touched with black which deepens a little upon the last rays. A vertical humeral spot crossing the third and fourth, sometimes the fourth and fifth scales of the lateral line; margin of caudal dusky; sides, excepting over the body-cavity, with chromatophores. Outer rays of the ventrals and pectorals chalky white.

#### 7. *HYPHESSOBRYCON BENTOSI* Durbin.

Plate 25, fig. 3; Plate 79, fig. 9, 9a.

*Hyphessobrycon bentosi* DURBIN, Bull. M. C. Z., 1908, **52**, p. 101 (Obidos); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436.

HABITAT.—Amazon.

Twenty-one specimens 20842 Cotypes      30–38 mm.      Obidos      Bentos

Head 3.3 to 3.5; depth 2.8–3.2; D. 11; A. 27–30; scales about 30–33; eye 2.5 in head; interorbital much less than the eye.

Compressed; depth of the head at the base of the occipital process 1.33 to 1.5 in the greatest depth. Preventral region rounded. Predorsal region slightly keeled.

Occipital process 5 in the distance from its base to the origin of the dorsal.

Interorbital flat. Frontal fontanel small, triangular, and two thirds the length of the parietal without the occipital groove. Second suborbital in contact with the preopercle below, having a narrow naked line behind; third suborbital narrow. Maxillary equal to the eye; mandible a little longer than the eye, a little more than two times in the head. Snout short. Premaxillary with two or three conical teeth in the outer row, and eight teeth, the first four always tricuspid, and the rest either tricuspid or conical, in the inner row. Maxillary with from four to eight, usually six, conical or narrowly three-pointed teeth. Dentary with five, rarely four, 3- to 5-pointed teeth; eight to thirteen minute conical ones on the side.

Gill-rakers  $8 + 14$ , long and slender.

Scales are mostly lost in the specimens.

The origin of the dorsal the length of the eye nearer to the snout than to the base of the caudal; the penultimate ray about 2.33 in the longest, which is 3.5 in the length. Caudal equals the length of the head. Anal somewhat emarginate, its origin on the vertical from the sixth dorsal ray; penultimate ray 3 in the longest which is 3.75 in the length. Ventrals on a vertical half the length of the eye, or a little more, in front of the dorsal, and reaching to the third anal ray. Pectorals overlapping a third of the ventrals.

A round black spot on the distal half of the second to sixth dorsal rays; the first, second, and third rays tipped with white, a white bar bounding the lower margin of the spot and covering the outer half of the proximal half of the marked rays, the basal fourth and other five rays hyaline. Anal, caudal, and other fins a little dusky. Upper scales margined with dusky. A very indistinct broad lateral band passing from the indistinct, or almost obsolete, brown humeral spot to the caudal peduncle. No caudal spot.

#### 8. *HYPHESOBRYCON ROSACEUS* Durbin.

Plate 23, fig. 5.

*Hyphessobrycon rosaceus* DURBIN, Ann. Carnegie mus., 1909, **6**, p. 67 (Gluck Island and Rockstone, Brit. Guiana); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436; Mem. Carnegie mus., 1912, **5**, p. 339, pl. 2, fig. 1; ELIAS, Ann. Carnegie mus., 1911, **8**, p. 159.

HABITAT.—British Guiana, Guaporé Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1190 C. Type	1	35	Gluck Island	Eigenmann
1191 C., 11768 I.	25	19-38	Gluck Island	Eigenmann
Paratypes				
1192 C. Paratype	1	34	Rockstone	Eigenmann
3078 C.	2	24-34	Bastos	Haseman

Head 3.33-3.67; depth 2.75; D. 11; A. 26 or 27; scales 5-31 to 33-3; eye 2.5 in head; interorbital almost equal to the eye, 2.6 in the head.

Compressed; depth of head at base of occipital process 1.5 in the greatest depth. Preventral regions without complete series of median scales. Predorsal region rounded, without complete series of median scales, slightly keeled.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital somewhat convex; frontal fontanel triangular, as wide as the parietal and almost equal to the length of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind but not below; third suborbital very small. Maxillary equal to the eye. Mandible longer than the eye, 2+ in the head. Snout short, mouth large. Premaxillary with two or three narrow tricuspid teeth in the outer row and six to eight small tricuspid and conical teeth in the inner row. The two rows of premaxillary teeth not so far apart as in most species of the genus. Maxillary with four to six very small narrowly tricuspid or conical teeth. Dentary with a graduated series of five 3- to 5-pointed teeth followed by about eight minute teeth on the sides.

Gill-rakers 8 + 12.

Anal sheath short, composed of 4 or 5 scales covering the base of the first 7 or 8 anal rays. Lateral line with pores developed on 6 or 7 scales.

Origin of dorsal about half the length of the eye nearer to the snout than to the caudal, the penultimate ray almost one third of the longest which is 3 to 3.5 in the length. Caudal equal to the head. Origin of the anal on vertical from the middle dorsal ray; anal emarginate, the longest ray 1.5-2 in the base, rays very close together. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals just reaching the first or second anal rays. Pectorals reaching a little beyond the base of the ventrals.

Humeral and caudal spots lacking. Scales of the back outlined with dusky. The entire sides, except over the body-cavity, with scattered chromatophores

which are a little thicker on the caudal peduncle and on the third and fourth scales of the lateral line and the 3 scales above them. The chromatophores are thinner over a small vertically elongate area immediately behind the humeral area just described. The lateral stripe very slender extending entirely to the caudal. Dorsal with a round intensely black spot on the first seven rays, the tips of the second and third rays white. The distal half of the longest anal ray and the tip of the next ray also white. All the fin-rays dusky. Scales on the sides with a pale blue iridescence in life. Rosy tinged, especially above anal, base of caudal lobes, and ventrals. Anal lobe and base and tip of dorsal lobe bright orange.

#### 9. *HYPHESSOBRYCON HASEMANI* Fowler.

*Hyphessobrycon hasemani* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 545, fig. 13 (Madeira River, above the Falls of Guajaramirim, approximately in Lat. S. 10° 47', Long. W. 65° 23').

This species is known only from the type, a specimen 28 mm. long, collected by E. A. Smith.

Head 3.25; depth 3.125; D. 10; A. 30; scales 32, 10 scales between dorsal and ventral; 11 predorsal scales; snout 4.25; eye 3.6; interorbital 3.5 in the head. No maxillary teeth; suborbitals completely covering cheeks.

No humeral or caudal spot, a black spot slightly above the middle of the first seven dorsal rays.

#### 10. *HYPHESSOBRYCON PANAMENSIS* Durbin.

Plate 26, fig. 1; Plate 33, fig. 4.

*Hyphessobrycon panamensis* DURBIN, Bull. M. C. Z., 1908, **52**, p. 101 (Boqueron River, Panama);

EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436.

*Hemigrammus minutus* MEEK & HILDEBRAND, Field mus. Publication, 1912, Zool. ser., **10**, p. 67 (Rio Agua Clara, Panama Canal Zone).

HABITAT.—Panama and Colombia.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm	Locality	Collector
20688	} Cotypes	31	Panama	Hassler Exped.
20688		29-32	Panama	Hassler Exped.
= - U. S. N. M.	1	32	Boqueron River, Panama	Busck

In addition to these on which the description is based, I have series of specimens from the Patia, San Juan, Atrato, and Magdalena Basins.

Head 3.25 to 4; depth 2.75 to 2.8; D. 11; A. 23-25; scales 7-34 to 36-46; eye 2.1-2.4, in the head; interorbital less than the eye, 3 in the head.

Very compressed; dorsal profile about equally arched with the ventral profile. Preventral region rounded, without a complete series of median scales. Predorsal region obscurely keeled, with a median series of 10 to 13 scales.

Occipital process little more than 4 in the distance from its base to the dorsal, bordered by 3 or 4 scales. Interorbital slightly convex. Frontal fontanel elongate, triangular, narrower than the parietal, as long as the parietal without the occipital groove. Second suborbital leaving a very narrow naked margin around its entire edge. Snout short, about 2 in the eye; mouth large. Maxillary slender, its anterior margin nearly straight to near the posterior angle where it is rounded, a little less than the eye, about 2.67 in the head. Mandible considerably longer than the eye, 2 in the head. Premaxillary with an outer row of three tricuspid teeth and an inner row of five 3- to 5-pointed teeth. Maxillary with three tricuspid or conical teeth. Dentary with four large teeth and a series of about seven abruptly smaller teeth on the side.

Gill-rakers 7 + 11.

Anal sheath short, with about 7 scales covering the base of the first 7 or 8 anal rays. Lateral line with pores developed on 9 to 13 scales.<sup>1</sup>

Origin of the dorsal equidistant from the snout and caudal, the penultimate ray two fifths of the longest, which is 3.25 in the length. Caudal about half the length of the eye shorter than the head. Origin of the anal on the vertical from the eighth or ninth dorsal ray. Anal long, somewhat emarginate, the longest ray about 1.5 in the base. Base of ventrals on the vertical from the first scale in front of the dorsal. Ventrals reaching the second or third anal ray. Pectorals reaching the first or second scale beyond the base of ventrals.

No humeral spot, no caudal spot. A few of the anal rays sometimes tipped with black, the other fins unmarked with black. Scales of the back and upper half of the sides broadly outlined with dusky. A very narrow lateral stripe. Numerous inconspicuous chromatophores everywhere on the body except over the body-cavity and a small area just behind the humeral region. A pale blue iridescence on the cheek and sides below the lateral stripe.

<sup>1</sup> In at least some of the Pacific slope specimens the line approaches completeness.

## 11. HYPHESSOBRYCON GRACILIS (Reinhardt).

Plate 22, fig. 4; Plate 26, fig. 2; Plate 79, fig. 7.

*Tetragonopterus gracilis* REINHARDT in Lütken, Overs. K. Dan. selsk. Forh., 1874, p. 133 (Lagoa Santa); LÜTKEN, Vellhas-Flodens fiske, 1875, p. 217, pl. 5, fig. 16, (Rio das Velhas); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 286; Boulenger, Boll. Mus. univ. Torino, 1895, 10, no. 196, p. 3 (Villa Rica).

*Hemigrammus gracilis* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 38, p. 15 (Lagoa Santa); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 340, pl. 44, fig. 4.

*Tetragonopterus schmardae* ULREY, (*non* Steindachner), Ann. N. Y. acad. sci., 1895, 8, p. 286 (Para).

HABITAT.—San Francisco, Paraguay, Amazon Basin, and British Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
21008	1977	24-30	Brazil	Justa
5176 I.	4	20-24	Para, Brazil	Hartt
5177 I.	1	27	Lower Amazon	Hartt
20812	1	44	Iça	James
1247 C., 11772 I.	16	19-24	Gluck Island	Eigenmann

Head 3-3.5; depth 3-3.5; D. 10, occasionally 11; A. 17-24<sup>1</sup>; scales 5-29 to 34-3.5 or 4; 6 to 13 pores in the lateral line; eye 2-2.5 in the head; interorbital little less than the eye, 2.7-3 in the head.

Compressed; head short, depth of head at the base of the occipital process 1.5 to 1.25 in the greatest depth. Preventral region rounded, with a regular median series of 9 to 12 scales. Predorsal region rounded, not keeled, with a regular median series of 9 scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 2 to 2.5 scales. Interorbital slightly convex. Frontal fontanel triangular, narrow, and equal to the length of the parietal without the occipital groove. Second suborbital leaving a naked border about one third of its own width; third suborbital small. Maxillary not quite equal to the length of the eye. Mandible a little longer than the eye. Snout short. Premaxillary with five 3- to 5-pointed teeth in the inner row, and two to four tricuspid teeth in the outer row. Maxillary with one to three very small tricuspid or conical teeth that are usually very difficult to see. Dentary with four, less frequently five

<sup>1</sup> The anal in No. 21008 varies from 17-20, in 5176 from 22-24, in 2812 there are 24, and in 5177 there are 21 anal rays.



4- to 5-pointed teeth in a graduated series, the last followed by seven or eight minute conical teeth.

Gill-rakers 7 or 8 + 12.

Anal sheath short, consisting of 3 or 4 scales and covering the bases of the first 7 rays. Lateral line with pores on 6 to 13 scales; four specimens in 21008 have lateral line complete.

Origin of the dorsal equidistant from the snout and caudal, the penultimate ray one third of the longest which is 4 in the length. Caudal equal to the length of the head *plus* the length of the eye. Origin of the anal on the vertical from the last dorsal ray; anal emarginate. Origin of the ventrals on the vertical from the first or second scale in front of the dorsal. Ventrals just reaching the anal; pectoral lapping a little onto the ventrals.

All of the fins hyaline except an occasional dim spot at the base of the caudal which never reaches the end of the caudal rays. A distinct silver lateral stripe subtending a very inconspicuous, narrow brown or black stripe. The scales of the lateral line and the series above and below it have iridescence. The scales over the body-cavity have a less pronounced blue iridescence.

## 12. *HYPHESSOBRYCON RIDDLEI* (Meek).

Plate 26, fig. 3; Plate 79, fig. 6, 14a.

*Hemigrammus riddlei* MEEK MS. EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 13 (Los Castillas).  
*Hyphessobrycon riddlei* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436; Mem. Carnegie mus., 1912, **5**, p. 340.

One specimen Type Field Museum      38 mm.      Los Castillas      Riddle

Head 3.85; depth 2.66; D. 10; A. 19; scales 5-32 to 34-3.5; eye and interorbital equal, 2.9 in the head.

Compressed; depth of head at the base of the occipital process 4.75 in the depth. Preventral region rounded, without regular and complete series of median scales. Predorsal region rounded, with complete median series of 10 scales.

Occipital process 7 in the distance between its base and the dorsal, bordered by 2.5 to 3 scales. Interorbital very slightly convex. Frontal fontanel triangular, very small, narrower than the parietal, and half the length of the parietal without the occipital groove. Second suborbital in contact with the preopercle. Mouth small. Maxillary very little shorter than the eye, 3 in the head. Mandible 2.1 in the head. Premaxillary with about ten very small

tricuspid teeth in the inner row and two conical or tricuspid ones in the outer row. Maxillary with four small conical and 3-pointed teeth. Dentary with a graduated series of about eight very small tricuspid teeth followed by four minute conical ones.

Gill-rakers 8 + 14.

Anal sheath probably obsolete. Lateral line with pores on about the first half of the scales.

Origin of the dorsal equidistant from the snout and the caudal, its penultimate ray 2.33 in the longest which is 3.33 in the length. Origin of the anal on the vertical from the first scale behind the dorsal. Anal slightly falcate. Base of ventrals on the vertical from the second scale in front of the dorsal. Ventrals barely reaching to the anal. Pectorals not reaching the ventrals by half the width of the eye.

A small black spot at the base of each caudal lobe. No humeral spot or lateral stripe. Scales of the dorsal surface and basis of the anal rays outlined with dusky. Fins all a little dusky.

A single specimen, 1248 C. M., 23 mm. from Rockstone, probably *H. riddlei* or very near it, differs as follows from the type of *H. riddlei* from Los Castillas. Dorsal profile straight. Maxillary with six conical teeth, premaxillary with twelve small teeth in the inner row and two in the outer. Depth 3.8; eye 3 in the head; D. 11; A. 20; scales 4-31-3.

### 13. *HYPHESSOBRYCON STRAMINEUS* Durbin.

*Hyphessobrycon stramineus* DURBIN MS. EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436 (Tabatinga).

One specimen 20772 Type      38 mm.      Tabatinga      Bourget

Head 4; depth 2.8; D. 10; A. 27; scales 5-32-3; eye 2.7 in the head, interorbital just equal to the eye.

Compressed; depth of head at the base of the occipital process 1.75 in the greatest depth. Preventral and predorsal regions rounded, without complete regular series of median scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2 + scales. Interorbital slightly convex. Frontal fontanel small, triangular, narrower than the parietals, little more than one half the parietal without the occipital groove. Second suborbital in contact with the preopercle. Snout shorter than the eye, mouth comparatively small. Maxillary about equal to

the eye; mandible equal to the eye, 2.7 in the head. Premaxillary with two conical teeth in the outer row and nine tricuspid teeth in the inner row. Maxillary without teeth. Dentary with a graduated series of about nine tricuspid teeth.

Gill-rakers 7 + 9.

Anal sheath probably short or lacking. Lateral line with pores developed on the first 7 scales.

Origin of the dorsal one half the length of the eye nearer to the caudal than to the snout, penultimate ray one third the longest which is 3.67 in the length. Caudal longer than the head. Origin of the anal on the vertical from the seventh dorsal ray. Anal emarginate, rays fine and close together, longest ray 1.8 in the base of the fin. Ventrals on the vertical from the second or third scale in front of the dorsal; ventrals not quite reaching the anal. Pectorals barely reaching the ventrals.

Caudal spot intense and round, not continued on the middle caudal rays. No humeral spot. Lateral stripe silvery, without dark pigment. Fins all hyaline. Suborbitals and the scales over the lateral stripe silvery iridescent. The specimen may be badly faded, as even the usual dusky coloration on the back is lacking.

#### 14. *HYPHESSOBRYCON TAUROCEPHALUS* Ellis.

Plate 29, fig. 3.

*Hyphessobrycon taurocephalus* ELLIS, Ann. Carnegie mus., 1912, 8, p. 151, pl. 1, fig. 4 (Serrinha Parana).

HABITAT.—Upper Iguassú.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3007 C. Type	1	55	Serrinha Parana, Rio Iguassú	Haseman
3008 C. Paratypes	32	30–46	Serrinha Parana, Rio Iguassú	Haseman
3009 C. Paratypes	22	30–45	Porto Uniao, Rio Iguassú	Haseman
3010 C. Paratypes	13	27–36	Porto Uniao, Rio Iguassú	Haseman

Head 3.8–4; depth 3; D. 11; A. 14 to 16; scales 5 or 6–32 to 36–4 to 5. Eye 3 to 3.25; interorbital much wider than the eye, 2.2 in the head.

Little compressed, depth of the head at the base of the occipital process 1.25 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded.

Occipital process a little more than 4 in the distance from its base to the dorsal, bordered by 2 or 3 scales. Frontal fontanel triangular, as wide as the parietal, two thirds of the parietal without the occipital groove. Second sub-orbital leaving a narrow naked margin behind and below. Maxillary margin very convex, the proximal third much constricted, very short, 1.5 in the eye or nearly 5 in the head; mandible short, equal to the eye, about 3 in the head. Mouth moderately large; snout very short, equal to the maxillary. Premaxillary with three 3- to 5-pointed teeth in the outer row, and five broad 5- to 7-pointed teeth in the inner row; the last of the inner series is often much reduced. Maxillary without teeth. Dentary with graduated series of four or five 5- to 7-pointed teeth followed by one or two small notched teeth on the sides.

Gill-rakers 7 + 10.

Anal sheath rudimentary. Lateral line with pores developed on 5 to 9 scales.

Origin of the dorsal the length of the eye nearer to the caudal than to the snout, the longest ray 4.6-5 in the length. Caudal equal to the head. Origin of the anal on the vertical from the second or third scale behind the dorsal. Anal emarginate, the longest rays almost equal to the anal base which about equals the head without the preopercle. Anal armature developed on the first six or seven rays. Ventrals on the vertical from the first or second scale in front of the dorsal, reaching the first, second, or third scale in front of the anal. Pectorals reaching the second or third scale in front of the ventrals.

Humeral spot lacking. Caudal spot sharply constricted behind and continued to the end of the middle caudal rays, continued forward as a heavy lateral stripe which often reaches the upper angle of the preopercle. The lateral stripe overlaid with a dull silvery. Dorsal, caudal, pectorals, and first five anal rays dusky. Scales of the back outlined with dusky. Bluish iridescence on the sides over and below the lateral stripe.

#### 15. *HYPHESSOBRYCON PARVELLUS* Ellis.

Plate 29, fig. 1.

*Hyphessobrycon parvellus* ELLIS, Ann. Carnegie mus., 1911, 8, p. 153, pl. 2, fig. 1.

HABITAT.—Southeastern Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3011 C. Type	1	30	Alagoinhas, Rio Catu	Haseman
3012 C. Paratypes	3	20-30	Alagoinhas, Rio Catu	Haseman
3013 C. Paratype	1	22	?	Haseman
2932 C. Paratypes	7	13-29	Rio Itapicurú, Queimadas	Haseman
3014 C. Paratype	1	17	Agua Quente	Haseman
2930 C. Paratype	1	18	Ribirão, Azul Lagoa	Haseman
2931 C. Paratype	1	12	Rio Tieté	Haseman

Head 3.5; depth 2.75; D. 11; A. 20 or 21; scales 5-32 to 34-3 to 4. Eye 2.3 in the head; interorbital less than the eye, about 2.7 in the head.

Compressed, depth of head at the base of the occipital process 1.25 in the greatest depth. Occipital process bordered by 2.5 scales. Interorbital convex. Frontal fontanel triangular, very small. Second suborbital leaving a narrow naked margin behind and below. Mouth rather small; snout very short, about 1.66 in the eye. Maxillary less than the eye, 2.6 in the head. Mandible equal to the eye. Premaxillary with three or four narrow, conical teeth in the outer row, and five or six tricuspid teeth in the inner row. Maxillary with, or without, one small, conical tooth. Dentary with a graduated series of four tricuspid teeth followed by three conical ones on the side.

Gill-rakers 11 + 9, short and strong.

Anal sheath composed of 6 scales covering the base of the first 10 rays. Lateral line with pores developed on the first 6 to 8 scales.

Origin of the dorsal equidistant from the snout and the caudal. Longest dorsal ray 3.5 in the length. Caudal a little longer than the head. Origin of the anal on the vertical from the last dorsal ray. Anal usually emarginate. Ventrals on the vertical from the first scale in front of the dorsal, ventrals just reaching the anal. Pectorals just reaching the ventrals.

No humeral spot. Caudal spot either diffuse or condensed. Lateral stripe narrow, faint, overlaid with silvery. Anal often with a dark margin. Longest anal and dorsal rays tipped with white. Sides, exclusive of region over body-cavity with numerous chromatophores.

16. *HYPHESSOBRYCON MINIMUS* Durbin.

Plate 22, fig. 6.

*Hyphessobrycon minimus* DURBIN, Ann. Carnegie mus., 1909, 6, p. 68 (Cane Grove Corner, British Guiana; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 341, pl. 49, fig. 2.

HABITAT.—Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1193 C. Type	1	18	Cane Grove Corner	Eigenmann
11769 I. Paratypes	4	16–21	Cane Grove Corner	Eigenmann

Head 3.33 to 3.67; depth 3.5 to 3.75; D. 11; A. 16 or 17; scales 5–30 to 33–3; eye 2+ in head, snout less than the eye, interorbital less than eye, about 3 in the head.

Compressed, depth of head at base of the occipital process five sixths of or equal to the greatest depth. Preventral region rounded, without regular complete series of median scales. Predorsal region rounded, with a regular series of 9 or 10 median scales.

Occipital process short, bordered by 1 to 1.5 scales. Frontal fontanels much narrower than the parietal, about three fourths the length of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Snout short, about 2 in the length of the eye; mouth moderately large. Maxillary less than the eye, 2.75 in the head. Mandible a little more than 2 in the head. Premaxillary with two, rarely three, small tricuspid teeth in the outer row, and five broad, 5- to 7-pointed teeth in the inner row, the tooth at the median end of the inner row of each premaxillary fitting together so that the two apparently form a very large median tooth. Maxillary with two or three broad 5- and 7-pointed teeth. Dentary with four large 7-pointed teeth followed on the sides by one or two minute tricuspid teeth.

Anal sheath of 3 scales covering the base of the first 5 or 6 rays. Lateral line with pores developed on 5 to 8 scales.

Origin of the dorsal equidistant from the snout and caudal, its longest ray 3.5 in the length. Origin of anal on the vertical from the last 2 or 3 dorsal rays. Anal emarginate, the longest ray 1.5 in the base. Ventrals on the vertical from the second dorsal ray. Ventrals just reaching the anal. Pectorals just reaching the ventrals.

Caudal spot intense black, roundish and scarcely if at all continued on the caudal rays. Humeral spot lacking but the intense narrow black lateral stripe widened somewhat in the humeral regions. Scales of the back and sides, above the lateral stripe, heavily outlined with dusky. All the fins somewhat dusky but without distinct black or white markings. Sides over the lateral stripe and below it with a steel-blue iridescence. Preopercle also with blue iridescence.

#### 17. *HYPHESSOBRYCON STIGMATIAS* Fowler.

*Hyphessobrycon stigmatias* FOWLER, Proc. acad. nat. sci. Phil., 1913, p. 547, fig. 14 (Tributary of the Madeira River near Porto Velho).

This species is known only from the type, 23 mm. long, No. 39231 A. N. S. P. Head 3.6; depth 3.6; D. 11; A. 19; scales 33, 9 scales between dorsal and ventral; snout 4; eye 2.5, interorbital 2.5 in the head.

Eleven predorsal scales. Maxillary with three cusps on its upper, anterior margin, suborbital nearly covering cheek.

Scales of back with dusky margins, fins all dusted; no defined humeral spot; a narrow dark lateral stripe widening above the middle of the anal, covering over half the caudal peduncle, contracted again on middle caudal rays.

#### 18. *HYPHESSOBRYCON ROBUSTULUS* (Cope).

*Hemigrammus robustulus* COPE, Proc. Amer. philos. Soc., 1870, **11**, p. 561 (Pebas); 1878, **17**, p. 690 (Peruvian Amazon); FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 335, fig. 24 (Pebas; Peruvian Amazon).

*Tetragonopterus robustulus* EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 286.

*Hyphessobrycon robustulus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437.

HABITAT.—Upper Amazon.

One Cotype 8083 Acad. nat. sci. Phil.

44 mm.

Pebas

Head 3.4–3.5; depth 2–2.25; D. 11; A. 27; scales 7–35–6; eye 3 in the head; interorbital just equal to the eye.

Compressed; deepest at the vertical from the origin of the dorsal; depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rather narrow, without complete series of median scales.

Occipital process 4.25 in the distance from its base to the dorsal, bordered by 2 scales. Interorbital region very slightly convex. Frontal fontanel triangular, one half of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Snout short, mouth large.

Maxillary equal to the eye. Mandible 2.5 in the head. Premaxillary with an inner row of five 5-pointed, and an outer row of four 3-pointed teeth. Maxillary with four or five rather small tricuspid teeth. Dentary with a graduated series of four large, 5-pointed, one small, 3-pointed and five or six minute conical teeth.

Gill-rakers 6 + 9.

Caudal seemingly naked. Lateral line with pores on 9 or 10 scales.

Origin of the dorsal equidistant from the caudal and snout. Origin of the anal on the vertical from the second dorsal ray. Anal emarginate. Ventrals on the vertical from about the fourth scale in front of the dorsal. Ventrals just reaching the anal or a little further. Pectorals reaching the ventrals.

Fins all dusky, the middle rays of the caudal black. Humeral spot indistinct, large, oval, and horizontally elongate. A broad leaden lateral stripe. Scales of the back outlined with pigment.

#### 19. *HYPHESSOBRYCON MELAZONATUS* Durbin.

Plate 26, fig. 4.

*Hyphessobrycon melazonatus* DURBIN, Bull. M. C. Z., 1908, **52**, p. 101 (Lago do Maximo; Silva, Lake Saraca); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436.

HABITAT.—Amazon.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20737 Type	1	about 38	Lago do Maximo	Agassiz
21069 Paratype	1	about 34	Silva, Lake Saraca	Thayer
20995	1	36	Serpa	Thayer Exped.

Head 3.5; depth 2.66–2.5; D. 11; A. 22; scales 5–34–3.5; eye 2.66 in head; interorbital equal to the eye.

Compressed, deepest at the origin of the dorsal; depth of head at the base of the occipital process 1.67 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete median series of 9 scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 2 to 2.5 scales. Interorbital slightly convex. Frontal fontanel triangular, as wide as and nine tenths as long as, the parietal without the occipital



groove. Second suborbital leaving a very narrow naked margin behind and below. Maxillary equal to the eye; mandible a fifth longer than the maxillary. Snout short. Lower jaw heavy. Mouth large. Premaxillary with an inner series of five 4- or 5-pointed teeth and an outer series of three or four tricuspid teeth. Maxillary with one to three 3- to 5-pointed teeth. Dentary with a graduated series of four large 5-pointed teeth followed by six or more minute conical ones on the side.

Gill-rakers about  $9 + 7$ .

Anal sheath short, consisting of very small scales that do not reach the rays, about 9 in number, the first 6 together and the other 3 between the larger scales of the series just above the fin. Lateral line with pores on about 7 scales.

Origin of the dorsal equidistant from the snout and the caudal, penultimate ray one third of the longest which is 3.25 in the length. Caudal probably about equal to the head. Origin of the anal on the vertical from the last dorsal ray or a little behind it. Anal emarginate. Ventrals on the vertical from the second scale in front of the dorsal. Ventrals just reaching the anal. Pectorals lapping half the length of the eye over the ventrals.

Webs of the dorsal and sometimes those of the anterior 7 or 8 anal rays dusky. A diffuse dark spot covering a little more than the lower half of caudal peduncle. Upper half of caudal peduncle silvery. A very faint humeral spot.

In the paratypes the second suborbital is not so wide as in the type and leaves a wider naked margin.

## 20. *HYPHESSOBRYCON EOS* Durbin.

Plate 23, fig. 4.

*Hyphessobrycon eos* DURBIN, Ann. Carnegie mus., 1909, **6**, p. 69 (Between Potaro Landing & Kangaruma); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437; Mem. Carnegie mus., 1912, **5**, 341, pl. 1, fig. 2.

HABITAT.—Guiana.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1194 C. Type	1	36	Between Potaro Landing & Kangaruma	Shideler
1196 C., 11770 I. Paratypes	24	35-42	Between Potaro Landing & Kangaruma	Shideler
1195 C., 11771 I. Paratypes	43	19-34	Tukeit	Eigenmann

Head 3.25-3.33; depth 2.5-2.7; D. 11; A. 17-20; scales 6-33 or 34-4; eye 2.5 in the head, snout about 2 in the eye, interorbital almost equal the eye, 2.76 in head.

Compressed; depth of head at base of occipital process 1.5 in the greatest depth. Preventral region rounded, without complete, regular series of median scales. Predorsal region rounded, with complete series of 10 median scales.

Occipital process about 8 in the distance from its base to the dorsal, bordered by 2 or 3 scales. Interorbital slightly more convex than in any other species of the genus. Frontal fontanel small, triangular, narrower than the parietal and two thirds the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind but not below. Snout short, mouth large. Maxillary equal to the eye; mandible scarcely longer than the eye, about 2.3 in head. Premaxillary with three or four narrow tricuspid teeth in the outer row, and five or six tricuspid teeth in the inner row. Maxillary with five to seven conical or very narrow 3-pointed teeth. Dentary with a series of four or sometimes five tricuspid teeth followed by a graduated series of seven to ten minute conical and 3-pointed teeth on the sides.

Gill-rakers about 6 + 10.

Anal sheath of 4 to 7 scales covering the bases of the first 7 rays. Pores developed on 7 to 10 scales.

Origin of the dorsal equidistant from the caudal and snout, penultimate ray one third the longest which is 3-3.25 in the length. Origin of anal on the vertical from the last dorsal ray. Anal very slightly emarginate, third ray not reaching to the base of the last ray, the longest ray 1.33 in the length of the base, anal armature well developed. Caudal equal to the head. Ventrals weak, on the vertical from the first scale in front of the dorsal or from the first dorsal ray; ventrals barely reaching the anal. Pectorals just reaching the ventrals, distinctly longer than ventrals.

Humeral spot very faint, vertically elongate, very near the head. Lateral stripe narrow and very indistinct. Caudal spot intensely black, covering the ventral two thirds of the caudal peduncle, a little narrower in front than on the vertical from the origin of the lower caudal lobe, not extending onto the caudal rays. The black is on the skin without the scales and also in the scales. Top of head and dorsal scales very dark. Scales of upper half of the sides heavily outlined with dusky. All fin-webs dusky. Numerous chromatophores scattered over the rest of the body, especially large and prominent on

the cheeks.<sup>1</sup> In life, anterior half of anal, base of anal, sides just above the anal, and ventrals reddish; caudal red or orange to deep yellow, lower lobe often more colored than the upper one, base of dorsal, pectorals, cheeks, and under part of head yellow.

## 21. HYPHESSOBRYCON INCONSTANS (Eigenmann and Ogle).

Plate 27, fig. 1, 2; Plate 33, fig. 1, 2; Plate 78, fig. 5; Plate 79, fig. 2.

*Hemigrammus inconstans* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 17, fig. 8 (Para).<sup>2</sup>

*HypheSSobrycon inconstans* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437.

*HypheSSobrycon proteus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 28.

HABITAT.—Colombia.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5094 C. <sup>3</sup>	1	74	Quibdo	Eigenmann
5095 C., 12858 I.	100+		Quibdo	Eigenmann
5096 C., 12852 I.	68	23 <sup>4</sup>	Soplaviento	Eigenmann
5097 C., 12853 I.	54	45 <sup>4</sup>	Calamar	Eigenmann
5098 C., 12854 I.	47	47	Cienega at Calamar	Eigenmann
5099 C., 12855 I.	2		Puerta Wilches	Eigenmann
5100 C.	1		Below Buena Vista	Eigenmann
5101 C.	1	39	Honda	Eigenmann
5102 C., 12856 I.	7	50 <sup>4</sup>	Bernal Creek, near Honda	Eigenmann
12857 I.	1	30 <sup>5</sup>	Apulo	Gonzales

<sup>1</sup> All specimens at hand were preserved in formalin and have the black pigment emphasized.

<sup>2</sup> Type, 34591 U. S. N. M. Para ? Brazil, scales 6-32-4.5, A. 26, lateral line on left  $13 + 1 + 2 + 3 + 1 + 7 + 2$ , on right  $15 + 14 + 4$ : one maxillary tooth.

Paratypes, four 37-45 mm. to base of caudal (47-57 over all) A. 24-26, scales 6-32 to 33-5; lateral line complete in two, in another, on the left  $10 + 1 + 2 + 16 + 3$ ; on the right  $17 + 2 + 1 + 9 + 3$ ; in another it is complete to within two or three scales.

<sup>3</sup> Type of *H. proteus*. An examination of the specimens from Quibdo on which the description is based shows eighteen with a complete lateral line, eleven with the line complete on one side and not on the other and seventy-six with the line incomplete on both sides. In the following table showing the lateral line on the two sides of a number of Quibdo specimens the numbers in italics indicate scales with pores.

Length mm.	Left side	Totals	Right side
57	32	32	33 = 33
70	14 + 1 + 4 + 14	= 32,	32 = 12 + 1 + 1 + 10 + 1 + 3 + 3 + 1
70	22 + 4 + 2 + 2 + 1 + 2 + 1	= 34,	33 = 15 + 1 + 2 + 1 + 1 + 13
73	14 + 19	= 33,	33 = 16 + 9 + 2 + 6
72	13 + 15 + 2 + 3	= 33,	32 = 14 + 2 + 2 + 4 + 2 + 1 + 2 + 5
69	19 + 7 + 6 + 1 + 1	= 34,	33 = 24 + 1 + 2 + 6
68	32	= 32,	33 = 33
76	28 + 2 + 2	= 32,	33 = 19 + 2 + 12
65	35	= 35,	35 = 35
60	23 + 4 + 1 + 2 + 4	= 34,	34 = 18 + 1 + 2 + 2 + 11

Very similar to *Astyanax ruberrimus* from the San Juan and Dagua Rivers from which the specimens with a complete lateral line can only be distinguished with difficulty. Its formal distinguishing features are the smaller number of anal rays, and smaller number of scales, and the nature of the scales below the lateral line.

Head about 4; depth 2.6-2.75; D. 11; A. 24-26, scales 6-32 or 33-4.5 to 5.5; eye equal to interorbital, 2.75-3 in the head.

Compressed, depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete median series of ten scales.

Occipital process about 6 in the distance from its base to the dorsal, bordered by about 2.5 to 3 scales. Interorbital convex. Second suborbital leaving a naked margin behind and below. Maxillary much shorter than the eye, about 3.5 in the head. Mandible a little longer than the maxillary, not longer than the eye. Premaxillary with five large 6- to 8-pointed teeth in the inner row, the last smaller than the rest and half hidden behind the one next to it, outer row with four 3- to 4-pointed teeth, set so as to coincide with the spaces between the first four of the inner series. Maxillary with one very broad, 7- to 8-pointed tooth. Dentary teeth large.

Anal sheath almost obsolete. Lateral line complete or irregularly incomplete, often interrupted.

Origin of the dorsal equidistant from the snout and caudal; penultimate ray 3 in the longest which is 3.5 in the length. Origin of anal on the vertical from the first scale behind the dorsal, anal emarginate. Ventrals on the vertical

<sup>3</sup> continued.

Length mm.	Left side	Totals	Right side
62	24 + 1 + 6 + 1 + 1	= 33,	33 = 22 + 1 + 8 + 1 + 1
51	22 + 12	= 34,	34 = 25 + 9
56	34	= 34,	34 = 34
62	32	= 32,	33 = 25 + 1 + 2 + 1 + 5
59	17 + 1 + 3 + 4 + 2 + 1 + 5	= 33,	33 = 20 + 5 + 2 + 1 + 5
65	33	= 33,	34 = 34
50	16 + 3 + 2 + 7 + 5	= 33,	33 = 33
64	33	= 33,	32 = 32
70	10 + 23	= 33,	33 = 10 + 23
56	10 + 22	= 32,	33 = 14 + 19
49	16 + 9 + 6 + 2	= 33,	33 = 16 + 8 + 2 + 3 + 2 + 2
65	23 + 1 + 5 + 4	= 33,	32 = 22 + 1 + 2 + 2 + 4 + 1
52	21 + 1 + 10	= 32,	32 = 27 + 1 + 4

Of the specimens from Calamar all but four have the lateral line incomplete. In the specimens from the Calamar Cienega the pores are between 7-22 in all but two. In one of the two it lacks but one or two scales of being complete, in the other it stutters as in most of the Quibdo specimens.

<sup>4</sup> Largest specimen.

<sup>5</sup> To base of caudal.

from the second scale in front of the dorsal. Ventrals reaching nearly or quite to the anal; pectorals reaching slightly beyond the base of the ventral.

Caudal spot conspicuous, not continued on the middle caudal rays. Humeral spot obscure and vertically elongated. Lateral band indistinct. Highly iridescent. Fins all dusky.

I hesitate to unite *H. proteus* from Colombia with *H. inconstans* from Para.

The following is the original description of *H. proteus*. The description above is drawn from two of the types of *H. inconstans*.

Head 4; depth 2.25-2.66; D. 11; A.  $\frac{22}{7}$ ,  $\frac{23}{4}$ ,  $\frac{24}{7}$ ,  $\frac{25}{11}$ ,  $\frac{26}{3}$ , the denominator indicating the number of individuals having the number of rays in the numerator. Scales 6 or 7 —  $\frac{32}{11}$ ,  $\frac{33}{26}$ ,  $\frac{34}{9}$ ,  $\frac{35}{2}$ , —  $4\frac{1}{2}$  to  $5\frac{1}{2}$ ; eye 2.6-2.75, equals interorbital; depth of caudal peduncle equal to its length.

Compressed, oval; dorsal and ventral profiles nearly equally curved, only a slight depression in the profile over the eyes; preventral area narrow, rounded, without a distinct median series of scales; or with a regular series of about eleven scales; postventral area rounded, with three or four scales; predorsal area keeled, with a distinct median series of nine or ten scales; occipital process about 5 in the length from its base to the dorsal, bordered by three or four pairs of scales; skull smooth, convex; parietal fontanel without the groove about one and a half times as long as the frontal fontanel. Second suborbital leaving a naked area one fifth to one half of its own width around its entire distal margin; maxillary-premaxillary border angulated, equal to a full diameter of the eye; the mouth terminal, the longitudinal extent of the premaxillary very short. Three or four teeth in the outer row of the premaxillary, five in the inner, the two rows parallel; a broad tipped, multipointed tooth on the maxillary; five rather small, 5-pointed graduate teeth in the mandible in front, none on the sides.

Gill-rakers 7 + 12.

Origin of dorsal about equidistant from snout and base of upper caudal lobe, its highest (second and third) rays about twice as high as the antepenultimate, the fin pointed, the highest ray a little longer than head; caudal lobes about 3 in the length; origin of anal behind the vertical from the last dorsal ray; anal emarginate, its base about 3.5 in the length; ventral usually not reaching anal, its origin equidistant from snout with the second or third scale in front of the dorsal, pectorals sometimes falling a little short of or extending a little beyond the origin of the ventrals.

Scales very regular, no interpolated rows of scales below the lateral line; the third row below the lateral line runs to the end of the anal, the fourth to the middle of the anal, the fifth to the sides over the first few anal rays; lateral line nearly straight; caudal lobes naked; anal with a sheath of a single row of scales; a large axillary scale; lateral line variable.

Silvery, a silvery lateral band; a faint humeral spot crosses the third scale of the lateral line; a large conspicuous triangular caudal spot extending on the bases of the middle caudal rays, not to their middle. Caudal lobes with cherry spots at the base becoming yellow toward the tip.

## 22. *HYPHESSOBRYCON SANTAE* (Eigenmann).

Plate 27, fig. 3; Plate 79, fig. 3, 3a.

*Hemigrammus santae* EIGENMANN, Proc. U. S. N. M., 1907, **33**, p. 16 (Lagoa Santa).

*Tetragonopterus rivularis interrupta* Lütken, Vidensk. selsk., 1875, **12**, p. 215 (Lagoa Santa).

*Hypheessobrycon santae* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437; ELLIS, Ann. Carnegie mus., 1911, **8**, p. 158 (Sete Lagoas; Mogy das Cruzes).

HABITAT.—Paraguay; Southeastern Brazil.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
55652 <sup>1</sup> Cotypes	2		Lagoa Santa	Reinhardt
10182 I.	4		Villa Rica, Colonia Gonzales	Anisits
3033 C.	6	33-42	Sete Lagoas	Haseman
3034 C.	1	58	Mogy das Cruzes	Haseman

Head 3.5; depth 2.6-3; D. 11; A. 20-22; scales 5-32-4, to 6-30-3.5, and 5-33-3.5; eye 2.25 in the head, equals the interorbital.

Compressed, deepest on the vertical from the fourth scale in front of the dorsal; depth of head at the base of the occipital process 1.33 in the greatest depth. Preventral region rounded, without a complete series of median scales. Predorsal region rounded, with regular median series of 11 scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 3.25 to 3.5 scales. Interorbital convex. Maxillary 3 in the head, mandible 2.5. Second suborbital leaving a naked margin behind and below. Premaxillary with four large 4- to 7-pointed teeth in the inner and three 3- to 5-pointed

<sup>1</sup> U. S. National Museum. Cotypes of *H. interrupta* and of *santae*.

ones in the outer row. Maxillary with two 3- to 5-pointed teeth. Dentary with a graduated series of five 5- to 7-pointed teeth.

Caudal naked, but with a sheath two scales deep. Anal sheath short. Lateral line with about 17 scales with pores.

Origin of the dorsal half the length of the eye nearer the caudal than the snout, the penultimate ray 2.5 in the longest which is 3.75 in the length. Origin of the anal on the vertical from the second scale behind the dorsal. Longest anal ray is 1.5 in the anal base. Ventrals on the vertical from the second scale in front of the dorsal. Ventrals reaching or not reaching the anal, pectorals reaching or not reaching the ventrals.

Humeral spot usually obscure; caudal spot usually faint, extending to the end of the middle caudal rays; lateral band very faint, overlaid with silvery, distinct stripes following the scales above the lateral line; dorsal and anal dusky.

### 23. *HYPHESSOBRYCON META*E Eigenmann and Henn.

Plate 93, fig. 3.

*Hyphessobrycon metae* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 24, p. 233.

HABITAT.—Rio Meta.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
13421 I. Type	1	34	Barrigona, Rio Meta	Gonzales
13422 I. Paratypes	66	16–35	Barrigona, Rio Meta	Gonzales

Head 3.5–4, equal to depth at origin of dorsal; D. 11; A. 19–23,  $\frac{19}{2}$ ,  $\frac{20}{1}$ ,  $\frac{21}{4}$ ,  $\frac{22}{4}$ ,  $\frac{23}{1}$ , (the denominator represents the number of individuals); scales about 30 in a longitudinal series, 10 in transverse series; pores developed on 6 (rarely 7) scales; 9 or 10 scales between occipital and dorsal origin; scales 5–6 + 24–4; eye 2.3–2.6 in head, about equal to interorbital; caudal peduncle about equal to eye and 1.2 in its own depth.

Slender, compressed; predorsal area rounded, with a median series of 9 or 10 scales, preventral area rounded, with a median interpolated series of small (6) scales. Occipital process 6 in the distance from its base to the dorsal, bordered by 2 or 3 scales, interorbital slightly convex; fontanels very large. First and second suborbitals leaving a high naked margin behind and below. Mouth blunt, terminal; maxillary five sixths the length of the eye. Pre-

maxillary with three or four narrow tricuspid or broadly conical teeth in the outer row, five 2- to 4-pointed teeth in a second series, an inner series of very small tricuspid or broadly conical teeth immediately behind them. Maxillary with two small tricuspid and one conical tooth, mandible with four strong 3- to 5-pointed incisors in each ramus followed by about seven minute conical or recurved teeth on the sides. Gill rakers 6 + 5, short and strong.

Origin of dorsal about equidistant from snout and base of middle caudal rays, its height 3.2 to 3.5 in the length; adipose well developed; height of anal lobe 4 to 5 in length of fish. Caudal deeply forked, its lobes equal, about 4.5 in entire length. Anal origin slightly behind vertical from last dorsal ray; pectorals reach beyond ventrals; ventrals to beyond anal origin.

An obscure dusky, humeral spot, operculum underlaid with a dusky vertical semilunar area; top of head deep black produced into a line from occiput to dorsal. A narrow intense lateral stripe from upper margin of operculum to below last dorsal rays, broadening to a heavy broad black band on the caudal peduncle and an oblong caudal spot, the latter produced as a triangle to the tips of the middle caudal rays. Margins of scales above lateral stripe outlined with dusky, below heavily sprinkled with chromatophores. Bases of caudal lobes in life evidently tinged with deep red.

#### 24. HYPHESSOBRYCON AGULHA Fowler.

*Hyphessobrycon agulha* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 549, fig. 15 (Madeira River, 200 miles of W. Long. 62° 20'; above Falls of Guajaramirim; Igarapé de Candalaria, tributary of the Madeira River, about S. Lat. 8° 15', W. Long. 63° 54'; tributaries of the Madeira River near Porto Velho).

Known from the specimens in the collection of the Academy of Natural Sciences of Philadelphia; the largest 42 mm. in length.

Head 3.75; depth 3.125; D. 12; A. 23; scales 6-12 + 22-3; snout 3.75, eye 2.4, interorbital 2.8 in the head.

Nine predorsal scales, maxillary reaching to the vertical from the anterior margin of the pupil; premaxillary with 8 teeth in each series. No maxillary teeth; mandible with four large quinquidentate teeth in front and small conic teeth on the side; suborbital leaving a very narrow naked strip in lower angle. Origin of dorsal equidistant from tip of snout and tip of adipose. No distinct caudal spot, humeral region with an elliptical, horizontal blotch continued downward. Fins pale, middle caudal rays dusky.



25. *HYPHESSOBRYCON ANISITSI* (Eigenmann).

Plate 28, fig. 1; Plate 79, fig. 4.

*Hemigrammus anisitsi* EIGENMANN, Proc. U. S. N. M., 1907, **33**, p. 16 (Villa Rica).*Hemigrammus lütkeni* EIGENMANN & KENNEDY, (in part, *non* Boulenger) Proc. Acad. nat. sci. Phil., 1903, p. 519 (Estancia la Armonia).*HypheSSobrycon anisitsi* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437; ELLIS, Ann. Carnegie mus., 1911, **8**, p. 158.

HABITAT.—Paraguay; Upper Parana Basin; Uruguay Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10182a I. Type	1	37	Villa Rica, Paraguay	Anisits
10182a I. Paratypes	3		Villa Rica	Anisits
9995 I. Paratypes	8	10–25 <sup>1</sup>	Estancia la Armonia, Paraguay	Anisits
3016 C.	36	30–45	Miguel Calmon, Tieté Basin	Haseman
3017 C.	21	21–44	Jundaihy, São Paulo	Haseman
3072 C.	2	53–55	Arequa, Paraguay	Haseman
2947 C.	3	26–35	Cacequy, Uruguay Basin	Haseman
3015 C.	7	41–57	Sapucay, Paraguay	Haseman

Head 3.5; depth 2.75–3; D. 11; A. 22 to 26; scales 6–33 to 36–5 or 6; lateral line with pores on 8 to 25 scales; eye about 2.75 in the head, interorbital about 3.

Compressed; depth of head at the base of the occipital process 1.25 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded with complete median series of 11 to 13 scales.

Occipital process 4 in the distance from its base to the dorsal, bordered by 3.5 to 4 scales. Interorbital slightly convex. Frontal fontanel triangularly oval, three fourths the length of the parietal without the occipital groove. Second suborbital small, its free margin surrounded with a naked margin of half its width or less. Mouth moderately large. Maxillary not as long as the eye, 3 in the head. Mandible a little longer than the eye. Premaxillary with an inner row of five teeth graduated from the second of the series which is 5- or 6-pointed, the fifth is 3-pointed and much smaller than the fourth; the outer row containing 2- to 4-pointed teeth. Maxillary with one 3-, rarely 5-pointed, tooth. Dentary with a graduated series of four 4- to 6-pointed teeth, and five or six minute conical or narrowly tricuspid ones on the side.

Gill-rakers 8 or 9 + 7.

Anal sheath consisting of 11 or 12 scales graduated in size from the first and covering the bases of 11 to 13 anal rays. Lateral line with pores on 8 to 25 scales, the average being about 16 or less. Sometimes many of the scales immediately following those with the pores have a notch on the margin.

Origin of dorsal equidistant from the snout and the base of the caudal or a little farther back, longest ray about 4 in the length. Caudal a little longer than the head. Origin of anal on the vertical from the fourth to ninth dorsal rays. Anal deeply emarginate, its longest ray 1.5 in the anal base. An anal armature developed on the first five rays of males 38–45 mm. long. Ventrals on the vertical from the third to fifth scales in front of the dorsal. Ventrals just reaching the anal. Pectorals a little more than reaching the ventrals.

Dorsal hyaline, caudal spot forming a band on the end of the caudal peduncle, fainter above and below, rather abruptly continued posteriorly to the end of the middle caudal rays, gradually narrowed in front and continued forward in a dark lateral stripe; caudal lobes hyaline; humeral spot vertically elongate. Distal third of the anal dusky, basal two thirds of anterior rays free from pigment. Scales along the dorsal margined with dusky. A silvery iridescence on the sides except the upper two rows of scales. In life the caudal lobes, the anal and region just above the anal, and the dorsal probably are a shade of red or yellow.

The five specimens from Sapucay (3015 em.) vary from typical specimens in having 25 to 29 anal rays. One of these specimens has also a 5-pointed tooth in the maxillary.

## 26. HYPHESSOBRYCON LÜTKENI (Boulenger).

Plate 28, fig. 2; Plate 79, fig. 1, 5.

*Tetragonopterus fasciatus interruptus* EIGENMANN (in part, *non* Lütken), Ann. N. Y. acad. sci., 1894, 7, p. 634 (Rio Grande do Sul).

*Hemigrammus interruptus* FOWLER (*non* Lütken), Proc. Acad. nat. sci. Phil., 1906, p. 335 (Jacuhy).

*Tetragonopterus lütkeni* BOULENGER, Ann. mag. nat. hist., 1887, ser. 5, 19, p. 173 (Rio Grande do Sul); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 287.

*Hemigrammus lütkeni* COPE, Proc. Amer. philos. soc., 1894, 33, p. 91 (Rio Grande do Sul); EIGENMANN & KENNEDY (in part), Proc. Acad. nat. sci. Phil., 1903, p. 519 (Arroyo Pypucu; Arroyo Trementina); EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 126, (Puerto Max, Colonia Gonzales).

*Hyphessobrycon lütkeni* EIGENMANN, Rept. Princeton univ. exped. Patagonia 1910, 3, p. 437; ELLIS, Ann. Carnegie mus., 1911, 8, p. 159.

HABITAT.—Rio Grande do Sul and Paraguay Basins.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20699	7	43-61	Maldonado	T. G. Cary
9996 I.	5	15-31	Arroyo Trementina	Anisits
11260 I.	6	23-29	Colonia Gonzales	Anisits
10294 I.	9	31-44	Puerto Max?	Anisits
9994 I.	41	25-40	Arroyo Pypucu	Anisits
4890 I.	3	53-65	Rio Grande do Sul	Von Ihering
3047 C.	58	25-69	Campos	Haseman
3041 C.	66	31-69	Porto Alegre	Haseman
3042 C.	11	40-54	Lagoa Feia	Haseman
3006 C.	9	26-48	Cacequy	Haseman
3005 C.	13	38-49	Muniz Freire	Haseman
2934 C.	1251	19-60	Jacarehy	Haseman
2933 C.	4	12-19	Jacarehy	Haseman
3073 C.	1	45	Arequa, Paraguay	Haseman
3074 C.	2	41-51	Sapucay, Paraguay	Haseman
2950 C.	6	40-48	Sao Joao da Barra	Haseman

Head 3.8-4.4; depth 2.35-2.6; D. 11; A. 20-26; scales 5 or 6-30 to 35-4 or 5; eye 2.75 in the head, equals the interorbital.

Compressed, deepest at the vertical from the origin of the dorsal. Depth of head at the base of the occipital processes 1.87 in the greatest depth. Preventral region rounded, without complete median series of scales. Predorsal region rounded, with complete median series of 9 or 10 scales.

Occipital process about 6 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital convex. Frontal fontanel triangular, two thirds of the parietal without the occipital groove. Second suborbital leaving a naked margin sometimes equal to one third of its width, behind and below. Maxillary three in the head. Mandible equal to the eye. Premaxillary with five 5- to 8-pointed teeth in the inner row and two to four, usually three, 5- to 7-pointed teeth in the outer row. Maxillary with two, rarely three, large, 6- to 9-pointed teeth. Dentary with a graduated series of six or seven large, 6- to 8-pointed teeth or the last one only 5-pointed and about half the height of its immediate predecessor. Beyond these is one small 4-pointed tooth which is about one fourth of the smallest of the continuous series.

Gill-rakers 13 + 7.

Anal sheath short, consisting of 7 scales and covering the bases of the first 8 rays. Lateral line having pores on 5 to 20 scales.<sup>1</sup>

<sup>1</sup> In three specimens of 2934 C. M. the lateral line is complete; out of nine specimens of 3006 C. M. one 32 mm. long the line is complete; of 3042 two specimens the lateral line is nearly complete and one has it interrupted 25 + 1 + 7 on one side and 17 + 2 + 2 + 5 + 3 + 5 on the other.

Origin of dorsal equidistant from snout and base of the caudal, penultimate ray 2.5 in the longest which is 4 in the length. Origin of anal on the vertical from the last dorsal ray; anal emarginate, its longest ray 2 in the length of the base. Ventrals on the vertical from between the first and second scales in front of the dorsal. Ventrals barely or not quite reaching the anal; pectorals almost reaching ventrals.

Caudal spot dark, sometimes reaching the tips of the middle caudal rays, continued forward as a black stripe which is (except in formalin specimens) overlaid with the broad silvery lateral band. Humeral spot large, very distinct, usually elongate vertically, the larger upper part surrounded by light in front and behind. All scales below the second series above the lateral line iridescent. The four scales between the upper end of the humeral spot and the head are bluish iridescent. Anal and dorsal a little dusky.

Five specimens 20895 and 20893 in part, 33–39 mm. (Muriáhe, Hartt, and Copeland), are probably a variety of *H. lütkeni*. They differ from the type as follows:—

Head 3–3.33, anal 22–26, scales 6–31 to 33–5.5, eye 2.5 in the head, inter-orbital 3.

Predorsal region with 11 scales in the complete median series.

Occipital process 5 in the distance from its base to the dorsal. Maxillary widest near its tip, instead of in its middle portion, as in typical specimens. Pre-maxillary with five 5- to 7-pointed teeth in the inner and two or three tricuspid ones in the outer row. Maxillary with two 6- to 7-pointed teeth which are somewhat chisel-shaped.

Ventral just reaching the anal, pectorals reaching half the length of the eye beyond the base of the ventrals.

Caudal spot continued to the end of the middle caudal rays. Humeral spot very faint.

The specimens from the Paraguay Basin have the caudal spot very heavy and extending band-like over the full width of the peduncle.

## 27. *HYPHESSOBRYCON RETICULATUS* Ellis.

Plate 29, fig. 2.

*Hyphessobrycon reticulatus* ELLIS, Ann. Carnegie mus., 1911, 8, p. 153, pl. 2, fig. 2 (Campos).

HABITAT.—Southeastern Brazil.



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VOL. XLIII. PART 3.

# THE AMERICAN CHARACIDÆ.

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*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3018 C. Type	1	48	Campos	Haseman
3019 C. Paratype	1	49	Morretes	Haseman
3020 C. Paratypes	7	40-43	Muniz Freire	Haseman
3021 C. Paratype	1	45	Mogy das Cruzes, Rio Tieté	Haseman
3022 C. Paratypes	8	40-46	Iguape	Haseman
3022 i-m C.	5	15-18 <sup>1</sup>	Iguape	Haseman
2946 C. Paratype	1	26	Caecquy	Haseman
3586 C. Paratype	1	30	Rio Doce	Haseman

Head 3.5-3.7; depth 2.5 or 2.6; D. 11; A. 18 to 21; scales 6 to 7-31 to 34-4 to 5; eye 2.7 to 3 in the head. Interorbital a little more than the eye, 2.2 in the head.

Compressed, depth of the head at base of the occipital process 1.5 in the greatest depth. Preventral region rounded, without complete median series of scales. Predorsal region usually with a regular series of 11 to 14 median scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2 scales. Interorbital nearly flat. Frontal fontanel triangular, as wide as the parietal and three fourths as long as the parietal without the occipital groove. Second suborbital in contact with the preopercle below and behind. Maxillary equal to the eye, mandible a little longer than the eye, 2.1 in the head. Mouth large, snout very short. Premaxillary with three to five tricuspid teeth in the outer row, and five 3- to 5-pointed teeth in the inner row. Maxillary rarely without teeth, usually with one small 3- to 5-pointed tooth. Dentary with a graduated series of four or five 3- to 5-pointed teeth followed by one or two small, tricuspid teeth and five or six very minute conical ones on the side.

Gill-rakers 7 + 9.

Anal sheath of about nine scales covering the bases of the first 10 rays. Lateral line with pores developed on the first 5 to 7 rays.

Origin of the dorsal the length of the eye nearer to the caudal than to the snout, penultimate ray 2.5 in the longest, which is 4.25 in the length. Caudal a little longer than the head. Origin of the anal on the vertical from the fifth to eighth dorsal rays. Base of anal convex. Anal subtruncate or only slightly emarginate, the longest ray 1.5 in the base. Ventrals on the vertical from the fourth scale in front of the dorsal. Ventrals just reaching the anal. Pectorals little more than just reaching the ventrals.

<sup>1</sup> Without the caudal; pectorals archaic.

Humeral spot intense black, round, but with faint vertical elongations, sometimes surrounded, more often followed, by a light area. Caudal spot irregular, more intense on the fin than on the caudal peduncle, not extending as far as half way to the end of the middle caudal rays. A narrow but intense lateral stripe in the region above the anal, fading out just before it joins the caudal spot and just in front of the vertical from the dorsal. A dark line along the base of the anal. Fins all dusky, especially the anal and lower lobe of the caudal. Scales all clearly outlined with brownish. Cheeks and back thickly peppered with brown chromatophores.

## 28. *HYPHESOBRYCON DURAGENYS* Ellis.

Plate 30, fig. 1.

*Hypnessobrycon duragenys* ELLIS, Ann. Carnegie mus., 1911, 8, p. 155, pl. 2, fig. 3.

HABITAT.—Rio Parahyba and Rio Tieté Basins.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3023 C. Type	1	68	Mogy das Cruzes, Rio Tieté	Haseman
3024 C. Paratypes	5	45-53	Mogy das Cruzes	Haseman
3025 C. Paratypes	9	28-43	Jacarehy	Haseman

Head 3.25-3.7; depth 2.5; D. 10 to 12; A. 16 to 18; scales 5 or 6-32 to 36-4 to 5; eye small, 3.0 to 3.5 in the head; interorbital wider than the length of the eye, 2.8 to 3.2 in the head.

Compressed. Depth of the head at the base of the occipital process 1.5 in the greatest depth. Preventral and predorsal regions rounded, usually without complete series of median scales.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 3 or 4 scales. Interorbital only slightly convex. Frontal fontanel triangular, as wide as the parietal, and one half to three fourths as long as the parietal without the occipital groove. Second suborbital usually in contact with the preopercle. Third suborbital about one half as wide as the eye. Mouth moderately large; snout short. Maxillary equal to the eye. Mandible longer than the eye, 2.5 to 3 in the head. Premaxillary with three or four tricuspid teeth in the outer row, and a graduated series of five 3- and 5-pointed teeth in the inner row. Maxillary with one tricuspid tooth. Dentary with a graduated

series of four 5-pointed teeth followed by three or four narrow, conical ones on the sides.

Gill-rakers 8 + 10.

Anal sheath short, of about five scales covering the base of the first 7 rays. Lateral line with pores developed on 9 to 12 scales.

Origin of the dorsal a little more than one half the eye nearer to the caudal than to the snout; penultimate ray one half the longest, which is 3.5 to 4 in the length. Caudal not as long as the head. Origin of the anal on the vertical from the first or second scale behind the dorsal. Anal obliquely truncate, the longest ray 1.33 in the base. Ventrals on the vertical from the third scale in front of the dorsal. Ventrals reaching the second or third scale in front of the anal. Pectorals reaching the first or second scale in front of the ventrals.

Humeral spot narrow and vertically elongate. Caudal spot intensely black, tapering forward into the lateral stripe, more suddenly constricted behind and continued to the end of the middle caudal rays. Lateral stripe overlaid with silvery; distal third of the anal more or less dusky. Scales of the back dusky; scales of the sides, especially below the lateral stripe, with a silvery blue iridescence.

One specimen 73 mm., Rio das Velhas, (C. 3076a). Varies from typical specimens as follows:—Depth 3.2. Maxillary with three tricuspid teeth; caudal spot diffuse; humeral spot triangular, longest in the vertical elongation but most intense at the posterior and horizontal limb.

## 29. *HYPHESSOBRYCON POECILOIDES* Eigenmann.

*Hyphessobrycon poecilioides* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 29 (Cali).

HABITAT.—Cauca Basin.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5091 C. Type	1	53	Cali	Eigenmann
5092 C. Paratypes {	50	69	Cali	Eigenmann
12850 I. Paratypes }				

Head 3.66–3.75; depth 2.66 ♀ –3 ♂; D. 11; A. 16–18; scales 36 in a longitudinal series, 12 series; usually about 9 scales with pores, rarely as many as 16; eye 4 in head, 1.66–2 in interorbital, equal to snout; depth of caudal peduncle 2.66–2.9 in the greatest depth.

Cyprinodontoid. Ventral surfaces rounded, the scales rather small, no distinct median series; about 12 scales in front of the dorsal, in a nearly regular series; interorbital but slightly convex, mouth very small, the maxillary very oblique, usually not quite equal to the eye; maxillary-premaxillary border three in the head; second suborbital sometimes covering the entire cheek, usually leaving a naked border behind and a naked triangle under its anterior angle; premaxillary with three to five teeth in the outer series; maxillary with one (sometimes none or two?) 5-pointed tooth; mandible with four graduated large teeth and two to five small ones on the sides.

Gill-rakers 11 + 15.

Dorsal a little nearer caudal than snout, its margin rounded; caudal lobes short, about equal to length of head; depth of caudal peduncle less than its length; anterior rays of anal the longer, the margin very slightly emarginate, its origin on the vertical from or behind the vertical from the base of the last dorsal ray; ventrals not reaching anal; pectorals short, rounded, about equal to head less snout and half the eye, not reaching ventrals by about three scales.

Scales regularly imbricate; no interpolated rows below the lateral line; caudal naked, a basal sheath of one row of scales along the anterior part of the entire anal; a small axillary scale.

Sides of head and body thickly covered with chromatophores; a wedge-shaped humeral spot crossing the third to fifth scale of the lateral line; a narrow black (in formaline) band from upper angle of gill-opening to end of middle caudal rays.

Anal tubercles in male scarcely evident.

### 30. *HYPHESSOBRYCON BELLOTTI* (Steindachner).

Plate 79, fig. 8.

*Tetragonopterus bellottii* STEINDACHNER, Flussf. Südamer., 1882, **4**, p. 31 (Tabatinga); Eigenmann & Eigenmann, Proc. U. S. N. M., 1891, **14**, p. 53; Ulrey, Ann. N. Y. acad. sci., 1895, **8**, p. 286 (Santarem).

*Hemigrammus bellottii* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 44.

*HypheSSobrycon bellottii* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437.

HABITAT.—AMAZONS.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
31507	4	23-34	Villa Bella	Agassiz
5174 I.	5	25-32	Brazil	Hiatt.

Head 3.2-3.75; depth 2.9-4; D. 11; A. 22-26; scales 5-31 to 33-3 or 3.5. Lateral line with pores on 5 to 10 scales. (One specimen had pores on 15 scales). Eye 2.5 in head; interorbital three in the head.

Compressed. Depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded, without complete median series of scales. Predorsal region rounded, with a complete series of median scales.

Occipital process 4 in the distance from its base to the dorsal, bordered by 3.5 scales. Interorbital slightly convex. Frontal fontanel triangular, two thirds of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin below and behind. Mouth large. Maxillary 3.5 in the head, three fourths of the eye. Mandible longer than the eye, 2.4 in the head. Premaxillary with an inner row of five 3- to 5-pointed teeth and an outer row of two to five conical to narrowly tricuspid teeth. Maxillary with two, rarely one, conical or 3-pointed tooth. Dentary with a series of four graduated, 3- to 4-pointed teeth, followed by from four to nine minute conical ones.

Gill-rakers 13 + 6, the last four on the horizontal limb very small.

Anal sheath short, consisting of four or five scales. Lateral line with pores on 5 to 10 scales, rarely on as many as 15.

Origin of the dorsal equidistant from the snout and the caudal, penultimate ray one third of the longest ray, which is 3 to 3.25 in the length. Origin of the anal on the vertical from the second scale in front of the dorsal. Ventrals just reaching the anal. Pectorals just reaching the ventrals.

Humeral spot intense brown on a light circle or oval, covering the fourth and fifth scales of the series just above the lateral line. A slim lateral stripe of brown overlaid with a wider indistinct silvery stripe. No caudal spot. Sides over the body-cavity somewhat iridescent. Fins hyaline or uniformly a little dusky. Specimens from Villa Bella have the scales of dorsal aspect outlined with pigment and a few chromatophores scattered along the lateral stripe.

Aside from having the dorsal scales outlined with pigment the specimens from Villa Bella differed from those from Brazil (Hiatt Coll.) in being much deeper. The original description of Steindachner gives 3.4 to 3.33 as the depth of *bellottii*, the present specimens from Villa Bella are 2.4 to 3.33, those from Brazil 3.67-3.9.

31. *HYPHESOBRYCON BIFASCIATUS* Ellis.

Plate 30, figs. 2, 3.

*Hyphessobrycon bifasciatus* ELLIS, Ann. Carnegie mus., 1911, 8, p. 156, pl. 2, fig. 4; pl. 3, fig. 1.

HABITAT.—Southeastern Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
2935 C. Cotypes	27	16–24, 41	Cacequy	Haseman
2936 C. Cotypes	39	26–46	Muniz Freire	Haseman
3026 C. Cotypes	2	44♂, 37 ♀	Campos	Haseman
3027 C. Cotypes	35	29–44	São João da Barra	Haseman
3028 C. Cotypes	2	41, 38	Xiririca	Haseman
3029 C. Cotypes	1	40	Porto Alegre	Haseman
3030 C. Cotypes	2	35♂, 47 ♀	Morretes	Haseman
3031 C. Cotypes	78	29–47	Campos	Haseman
3032 C. Cotypes	13	31–44	Lagoa Feia, Tocas	Haseman

Head 3.8; depth 2.5; D. 11; A. 29–32; scales 6 or 7–33 to 36–5 or 6; eye 2.3 to 2.5 in the head; interorbital almost equals the eye, 2.8 in the head.

Compressed. Depth of the head at the base of occipital process 1.67 in the greatest depth. Preventral and predorsal regions rounded, without complete series of median scales.

Occipital process about 5 in the distance from its base to the dorsal. Interorbital slightly convex. Frontal fontanel triangular, as wide as the parietal and four fifths as long as the parietal without the occipital groove. Second suborbital leaving a naked margin, equal to half its own width, behind and below. Maxillary not quite equal to the eye, a little more than 3 in the head. Mandible equal to the eye. Mouth moderate, snout .5 in the eye. Premaxillary with three or four narrow, tricuspid or broadly conical teeth in the outer row, and four or five 5- to 7-pointed teeth in the inner row. Maxillary with one 3- or 5-pointed tooth of medium size. Dentary with a weakly graduated series of four, sometimes five 5- to 7-pointed teeth followed by two or three quite small ones on the sides.

Gill-rakers 6 + 10.

Scales on the ventral half of the sides face a little obliquely backwards and downwards, especially in the region directly over the base of the anal where they are often more or less crowded. A small scale interpolated at the base



of each anal ray. The first 11 to 13 of these interpolated scales larger and extending onto the base of the rays so as to form a short anal sheath. Lateral line with pores on the first 6 to 9 scales.

Origin of the dorsal equidistant from the snout and caudal; penultimate ray about one third of the longest which is 3.33-3.67 in the length. Caudal a little shorter than the head. Origin of the anal on the vertical from the eighth dorsal ray. Anal of male somewhat rounded, the last ray one half the longest which is almost twice the length of the eye. Anal armature developed as a series of small recurved hooks on each of the first fifteen to twenty rays. Anal of the female emarginate, the longest ray 1.67 in the anal's base; the last rays much shorter than in the males of equal size. Ventrals on the vertical from the first or second scale in front of the dorsal, barely reaching the anal in females but prolonged to the base of the seventh to tenth anal rays in males. Pectorals just reaching the ventrals.

A vertically elongate humeral spot, followed by a bright bar, and a second dusky bar extending almost entirely across the sides. Seven to twelve black V-shaped lines, the angle toward the head, along the very faint silvery lateral stripe. No caudal spot. Fins all somewhat dusky except along the outside of the ventrals of the males and sometimes at the bases of the caudal and anal in females. Scales of the back and upper half of the sides outlined with dusky. The region over the anal with many large pale chromatophores. The very young specimens, 16-24 mm., from Cacequy had all the markings very poorly developed, the chromatophores being more evenly distributed.

### 32. *HYPHESSOBRYCON CATABLEPTUS* (Durbín).

*Dematocheir catablepta* DURBIN, Ann. Carnegie mus., 1909, **6**, p. 55; EIGENMANN, Mem. Carnegie mus., 1912, **5**, p. 343.

HABITAT.—Guiana.

One specimen 1198 C. Type. 18 mm. Tumatumari, above the Falls. Eigenmann.

Head 3.5; depth 3.8; D. 11; A. 20; scales 5-33-3; eye 2.5 in the head; interorbital very slightly greater than the eye 2.2 in head.

Compressed. Depth of head at the base of the occipital process very nearly equal to the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded.

Occipital process short. Interorbital flat. Frontal fontanel triangular,

narrower than the parietal, slightly longer than the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Mouth moderately large; snout short, about half the length of the eye. Maxillary 1.25 in the eye. Mandible equal to the eye. Premaxillary with five small conical teeth in the outer row and five tricuspid teeth in the inner row. Maxillary with seven small conical teeth closely packed together. Dentary with a series of four rather broad tricuspid teeth. Probably followed by several minute ones on the sides.

Caudal naked. Anal sheath reduced to a single small scale not extending onto the first anal rays. Pores developed on the first 9 scales of the lateral line, the rest of the scales in the series with a shallow notch on the free margin.

Origin of the dorsal equidistant from the snout and caudal; penultimate ray 1.66 in the longest which is 3.2 in the length. Caudal not so long as the head. Origin of the anal on the vertical from the second scale behind the dorsal. Anal emarginate, the longest ray about 1.33 in the length of the base. Ventrals on the vertical from the first dorsal ray. Ventrals just reaching the anal. Pectorals short and paddle shaped with a fringe of soft rays.

Humeral spot vertically elongate, very faint. No caudal spot but a few chromatophores at the base of each caudal lobe. Lateral stripe very dim. Scales of the back outlined with dusky. Fins without pigment.

### 33. *HYPHESOBRYCON STICTUS* Durbin.

Plate 22, fig. 1.

*Hyphe sobrycon stictus* DUBIN, Ann. Carnegie mus., 1909, 6, p. 71; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437; Mem. Carnegie mus., 1912, 5, p. 342, pl. 49, fig. 7.

HABITAT.—Guiana, Amazon.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1197 C. Type	1	38	Lama Stop-Off	Eigenmann
1435 C., 11895 I. Paratypes	108		Maduni Creek	Eigenmann
1436 C., 11896 I. Paratypes	117	22-39	Lama Stop-Off	Eigenmann
1437 C. Paratype	1		Rockstone	Eigenmann
1438 C., 11897 I. Paratypes	10		Christianburg Canal	Eigenmann
1439 C. Paratype	1		Cane Grove Corner	Eigenmann
3079 C.	4	33-36	Santarem	Haseman
3080 C.	2	36-40	Manaos	Haseman
	110	27-43	Hubabu Creek, Guiana	Ellis

Head 3.5 to 3.8; depth 2.75 to 3.25; D. 11; A. 26-31; scales 6-33 to 35-4; eye 2.25 in head, snout 2 in the eye; interorbital less than the eye, about 2.5 in head.

Compressed. Depth of head at the base of the occipital process 1.33 to 1.5 in the greatest depth. Preventral region rounded, without regular complete series of median scales. Predorsal region rounded, with complete series of 9 to 11 median scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 5 scales. Interorbital very slightly convex. Frontal fontanel large, triangular, only slightly narrower than parietal, as long as the parietal without the occipital groove. Second suborbital leaving naked margins behind and below. Mouth moderately large; snout short. Maxillary not so long as the eye. Mandible equal to the eye. Premaxillary with two or three, rarely four, small 5- to 7-pointed teeth in the outer row, and five large 7- to 9-pointed teeth in the inner row. Maxillary with one to three broad 7-pointed teeth. Dentary with five or six large 7- to 9-pointed teeth followed by two or three very small, but multicuspid teeth on the side.

Gill-rakers about 5 + 11.

Base of the caudal sometimes a very little scaled, the broad terminal scale often wanting. Anal sheath short, composed of four scales covering the bases of the first 6 rays. Pores on 7 to 11 scales.

Origin of the dorsal a third the length of the eye nearer the base of the caudal than the snout; penultimate rays 4 in the longest which is 2.5 to 2.67 in the length. Origin of anal on the vertical from the last dorsal ray; longest ray 1.66 in the base which is 1.2 times the head. Ventrals on the vertical from the first or second scale in front of the dorsal. Ventrals just reaching the anal. Pectoral never reaching beyond the second scale in front of the ventrals.

Humeral spot round, very intense, surrounded by a light ring; the center of humeral spot equidistant from posterior margin of the eye and the dorsal; very frequently a less intense dark bar extending obliquely downwards and forwards, and another shorter one extending obliquely upwards and forwards. A faint secondary humeral spot the width of two scales behind the first. Lateral stripe sharp and very narrow, not reaching the caudal. No caudal spot. Dorsal scales outlined with dusky. Sides silvery iridescent.

Caudal peduncle to in front of adipose, the adipose and caudal except the lobes richest cherry-red. Caudal lobes, anal, and dorsal canary-yellow.

A specimen from Lama Stop-Off 24 mm. has more than ordinary number of scales on the caudal and only 19 anal rays.

34. *HYPHESOBRYCON ECUADORIENSIS* Eigenmann and Henn.

Plate 93, fig. 6.

*Hyphessobrycon ecuadoriensis* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 19, p. 9 (Vinces).

HABITAT.—Ecuador.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
13105 a I. Type	1	31	Near Vinces, Ecuador	Henn.
13105 b I. Paratypes	200+		Near Vinces, Ecuador	Henn.
5417 a-x Paratypes	200+		Near Vinces, Ecuador	Henn.

Head 3.5; depth 2.6-3; depth of caudal peduncle 7-8; D. 11; A. 22-24; scales about 30 in a longitudinal series, about 11 in a cross-series, but few scales with pores; eye 3 in head, greater than interorbital.

Compressed, rather deep, caudal peduncle slender. Predorsal area rounded, with a median series of about 11 scales. Preventral area rounded, without distinct median series of scales.

Skull smooth, fontanels very large; second suborbital with a strongly convex margin, leaving but a narrow naked margin; mouth oblique, terminal, the maxillary short, only two thirds the length of the eye. Premaxillary with six or eight teeth, the lateral one conic the rest all tricuspid, a smaller tricuspid tooth in front of the space between the second and third of the inner series, occasionally between them and forming a continuous series with them. Maxillary with none to three minute teeth; mandible with ten or more graduate teeth of which the anterior ones are tricuspid the rest conical.

Gill-rakers well developed on both arches.

Origin of dorsal a little behind the middle, its height 4 in the length, adipose well developed; height of anal lobe 4.5 in the length, caudal lobes 3. Origin of anal under middle of dorsal. Ventrals reaching anal or further, pectorals to or beyond origin of ventrals. Lateral line developed on 5 or 6 scales.

A conspicuous vertical black humeral spot, sides gray, no caudal line, no silvery lateral band or caudal spot, caudal and anal obscurely margined with dark.

Color in life brilliant; ventrals, anal, and caudal bright cherry-red, dorsal sometimes with less red; region above anal with many cherry chromatophores.

Allied to *H. panamensis* from which specimens of equal size differ in the wider second suborbital, the broader predorsal area, the smaller eye, the shorter anal, the color, etc.

### 35. *HYPHESOBRYCON HETERORHABDUS* (Urey).

Plate 28, fig. 3; Plate 79, fig. 10.

*Tetragonopterus heterorhabdus* UREY, Ann. N. Y. acad. sci., 1895, 8, p. 286 (Para; Brazil).

*Hemigrammus heterorhabdus*, EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 11.

*Hyphessobrycon heterorhabdus*, EIGENMANN, Rept. Princeton univ., Exped. Patagonia, 1910, 3, p. 137; ELLIS, Ann. Carnegie mus., 1911, 8, p. 159 (Bragança).

HABITAT.—Lower Amazon.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5496 I. Cotypes	8	6-26	Brazil	Hartt
5506 I. Cotypes	5	17-24	Para	Hartt
3004 C.	2	29, 33 (about)	Bragança	Haseman

Head 3.5-3.75; depth 3-3.5; D. 10; A. 20-23; scales 5-32 to 34-3; eye 2.5 in the head; interorbital equals the eye.

Compressed. Depth of head at the base of the occipital process 1.25 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete series of 11 median scales.

Occipital process 6 to 7 in the distance from its base to the dorsal, bordered by 2.5 to 3 scales. Interorbital convex. Frontal fontanel triangular, four fifths the length of the parietal without the occipital groove. Second suborbital leaving a naked margin behind and below. Maxillary equal to the eye. Mandible almost imperceptibly longer. Mouth large. Premaxillary with four or five, 3- to 5-pointed teeth in the inner, and four conical or narrowly tricuspid ones in the outer row. Maxillary with four conical teeth. Dentary with a graduated series of four, 3- to 4-pointed teeth and three or four minute conical ones on the sides.

Gill-rakers 7 + 12.

Anal sheath short, probably of about three scales. Lateral line with pores on 8 or 9 scales.

Origin of the dorsal equidistant between the snout and caudal, the penultimate ray 2.5 to 3 in the longest, a little less than 4 in the length. Origin of the anal on the vertical from the last dorsal ray. Anal emarginate. Ventrals on the vertical from the second scale in front of the dorsal. Ventral not reaching the anal; pectorals not reaching the ventrals.

Caudal spot absent. Humeral spot represented by the expansion of the anterior end of a very distinct broad lateral stripe which is bordered above with a silvery band. A crescent of silvery bordering the lower side of the humeral expansion of the lateral stripe. The scales below the stripe slightly iridescent.

### 36. *HYPHESSOBRYCON MELANOPLEURUS* Ellis.

Plate 30, fig. 4.

*Hyphessobrycon melanopleura* ELLIS, Ann. Carnegie mus., 1911, 8, p. 157, pl. 3, fig. 2.

HABITAT.—Rio Tieté Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3035 C. Type	1	34	Alto da Serra, São Paulo	Haseman
3036 C. Cotypes	2	32, 35	Alto da Serra, São Paulo	Haseman

Head 3.8; depth 3.2 to 3.5; D. 10 or 11; A. 26 to 28; scales 6 or 7–30 to 36–5; eye 3 in the head; interorbital a little greater than the eye, 2.5 in the head.

Compressed. Depth of head at the base of the occipital process 1.3 in the greatest depth. Preventral and predorsal regions narrowly rounded, without complete series of median scales.

Occipital process short, about 8 in the distance from its base to the dorsal. Interorbital nearly flat. Frontal fontanel narrowly triangular, as wide as the parietal and 1.5 in the parietal without the occipital groove. Maxillary a little less and mandible a little more than the eye. Mouth rather large; snout very short, 1.8 in the head. Premaxillary with four tricuspid teeth in the inner row, and two or three slightly narrower teeth in the outer row. Maxillary with four or five narrow tricuspid to conical teeth. Dentary with a series of four strong tricuspid teeth, followed by about seven minute conical ones on the side.

Gill-rakers 6 + 9, each with a single row of very small spines.

Lateral line with pores developed on 7 to 9 scales.

Origin of the dorsal nearly the length of the eye nearer the caudal than to the snout; highest dorsal ray 1.3 in the head. Origin of the anal on the vertical from the third dorsal ray. Anal rather deeply emarginate; longest anal ray about 2 in the base of anal and about 1.7 in the head. Ventrals on the vertical from the fourth or fifth scale in front of the dorsal. Ventrals short and weak,

scarcely reaching the first long anal rays. Pectorals large, reaching beyond the middle of the ventrals.

Ground color light; a broad blackish stripe from the eye to the end of the middle caudal rays, becoming fainter behind the adipose; a very faint lateral elongation of the lateral stripe in the region of the humeral spot. A faint, dusky, oblique stripe across the dorsal from the base of the first to the tips of the seventh and eighth rays. All of the fins a little dusky. Scales of the back heavily outlined with dusky, top of the head and lips quite dark. Sides and head silvery between the lateral stripes.

### 11. HASEMANIA Ellis.

For John Haseman.

*Hasemania* ELLIS, Ann. Carnegie mus., 1911, 8, p. 148.

TYPE.—*Hasemania melanura* Ellis.

A Tetragonopterid, with two rows of premaxillary teeth, the maxillary without teeth or with a few teeth in its upper angle, the lateral line incomplete, the caudal naked. No adipose fin. Like *Hyphessobrycon* but without an adipose. Pectoral frequently archaic in small specimens.

HABITAT.—Southeastern Brazil.

#### *Key to the Species.*

- a. Maxillary equal to the eye, with two small tricuspid teeth. Premaxillary teeth narrow, tricuspid or conical. Snout sharp; interorbital narrow, less than the eye, 4 in the head. D.11; A. 19; scales 7-32-5 or 6.....1. *maxillaris* Ellis.
- aa. Maxillary less than the eye, elliptical, without teeth. Teeth in the inner row of the premaxillary with more than 3 points. Interorbital 3 or less, in the head.
  - b. Snout short and blunt. Dentary with four or five 5- or 6-pointed teeth. A distinct blackish caudal spot extending to the tips of the middle caudal rays. D.11; A.16 to 18; scales 6-33 to 36-5.....2. *melanura* Ellis.
  - bb. Dentary with three broad chisel-shaped, 8- or 9-pointed teeth. No distinct caudal spot; a heavy black lateral stripe, another black stripe along the underside of the caudal peduncle extending to the base of the last anal ray and continued in a straight line to just above the first anal ray. D.11; A.14 to 17; scales 5-33 or 34-4.....3. *bilineata* Ellis.

### 1. HASEMANIA MAXILLARIS Ellis.

Plate 31, fig. 1.

*Hasemania maxillaris* ELLIS, Ann. Carnegie mus., 1911, 8, p. 148, pl. 1, fig. 1.

One specimen 2937 C. Type. 29 mm. Porto Uniao, Rio Iguassú. Haseman.

Head 3; depth 3; D. 11; A. 19; scales 7-32-5 or 6; eye 3 in the head; interorbital less than the eye, about 4 in the head.

Compressed. Depth of head at the base of the occipital process 1.2 in the greatest depth. Preventral region rounded. Predorsal region rounded, without a regular series of median scales.

Occipital process a little more than 5 in the distance from its base to the dorsal. Interorbital nearly flat. Frontal fontanel triangular, as wide as the parietal, and two thirds as long as the parietal without the occipital groove. Second suborbital with a wide naked margin behind and below. Mouth large; snout pointed rather short. Maxillary equal to the eye. Mandible longer than the eye, 2.4 in the head. Premaxillary with five tricuspid and conical teeth in the inner row and three conical teeth in the outer row. Maxillary with two conical teeth. Dentary with five or six tricuspid teeth, followed by three to six very small conical ones on the sides.

Gill-rakers 6 + 9.

Scales cycloid, striae crooked, more numerous near the sides of the free margin of the scale, variable in number (18+). Caudal naked. No anal sheath extending over the rays of the fin, but a series or part of a series of small scales along the base of the anal. Lateral line with pores developed on about 6 scales.

Origin of the dorsal the length of the eye nearer to the caudal than to the snout, its longest ray about 4.5 in the length. Caudal probably about 1.33 in the head. Origin of the anal on the vertical from the ninth dorsal ray. Anal truncate. Ventrals on the vertical from the first dorsal ray, very short, just reaching the second scale in front of the anal. Pectorals archaic. Adipose lacking.

No humeral spots. A faint caudal spot not continued on the rays. Lateral stripe very faint. Dorsal, caudal, and ventrals uniformly dusky; distal half of anal dusky. All the scales, excepting those in the preventral region outlined with dusky; much darker along the back; silvery except along the back.

## 2. *HASEMANIA MELANURA* Ellis.

Plate 31, fig. 2.

*Hasemanía melanura* ELLIS, Ann. Carnegie mus., 1911, 8, p. 149, pl. 1, fig. 2.

HABITAT.—Rio Iguassú, southeastern Brazil.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3002 C. Type	1	35	Porto Uniao, Rio Iguassú	Haseman
3003 C. Paratypes	49	25-44		



Head 3.2 to 3.7; depth 2.6 to 2.8; D. 11; A. 16 to 18; scales 6-33 to 36-5; eye rather small, 3 in the head; interorbital equal to or greater than the eye, 2.8 to 3 in the head.

Compressed. Depth of head at the base of the occipital process 1.6 in the greatest depth. Predorsal region rounded, with or without a complete series of 11 median scales.

Occipital process short, about 6 in the distance from its base to the dorsal, bordered by 2 or 3 scales. Frontal fontanel an almost equilateral triangle, narrower than the parietal fontanel and 1.6 in the parietal without the occipital groove. Second suborbital leaving a naked margin behind and below. Snout short and moderately blunt, less than the eye, 4 in the head. Maxillary shorter than the eye, equal to the length of the snout, elliptical in outline, the front and back not parallel. Mandible equal to the eye. Premaxillary with four or five 5- to 7-pointed teeth in the inner row, and three 3-pointed teeth in the outer row. Maxillary without teeth. Dentary with a graduated series of four or five 5- or 6-pointed teeth, followed by four or five minute ones on the sides.

Gill-rakers 6 + 8.

Anal sheath very short. Lateral line with pores developed on 7 or 8 scales.

Origin of the dorsal half the length of the eye nearer to the caudal than to the snout. Longest dorsal ray 4.7 in the length. Origin of the anal on the vertical from the third or fourth scale behind the dorsal. Anal truncate, the longest ray equal to the length of the base. Caudal shorter than the head, 4 in the length. Ventrals on the vertical from the first dorsal ray, very small, reaching the third or fourth scale in front of the anal. Pectorals normal but small, reaching the third to fifth scale in front of the ventrals.

No humeral spot. Lateral stripe narrow, lead-gray, extending from the humeral region to the triangular caudal spot. Caudal spot narrowed abruptly behind and continued to the tips of the middle caudal rays. Dorsal, anal, ventrals, and pectorals unmarked but somewhat dusky. Scales silvery below the lateral line.

### 3. *HASEMANIA BILINEATA* Ellis.

Plate 31, fig. 3.

*Hasemania bilineata* ELLIS, Ann. Carnegie mus., 1911, 8, p. 150, pl. 1, f. 3.

HABITAT.—Rio Tieté Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3001 C. Type	1	41	Alto da Serra, São Paulo	Haseman
2938 C. Paratypes	4	20-38	Mogy das Cruzes	Haseman
2939 C. Paratypes	4	14-16		

Head 3.5; depth 2.8 to 3; D. 11; A. 14 to 17; scales 5-33 or 34-4; eye 2.5 to 3 in the head; interorbital equal to the eye.

Compressed. Depth of head at the base of the occipital process 1.33 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with a regular series of about 11 scales.

Occipital process short, 6 or more in the distance from its base to the dorsal. Interorbital almost flat. Frontal fontanel truncate, not so wide as the parietal, three fourths as long as the parietal without the occipital groove. Second suborbital with narrow naked margin behind and below. Maxillary less than the eye, 3.6 in the head. Mandible equal to the eye. Premaxillary with four 7-pointed teeth in the inner row and one conical or tricuspid tooth representing the outer series. Maxillary without teeth. Dentary with three broad, chisel-shaped teeth with 8 or 9 points.

Gill-rakers 8 + 11.

Anal sheath very short or lacking. Lateral line with pores on the first 3 to 6 scales.

Scales cycloid. Probably no interpolated scales or rows of scales.

Origin of the dorsal equidistant from the snout and caudal, the longest ray 3.8 in the length. Origin of the anal on the vertical from the last dorsal ray. Anal rounded, the longest ray equal to the base. Ventrals on the vertical from the third or fourth scale in front of the dorsal. Ventrals reaching to the third or fourth scale in front of the anal. Pectorals, (of fishes over 16 mm.) normal in form and reaching the fourth or fifth scale in front of the ventrals; pectorals of specimens of less than 16 mm., archaic. Adipose lacking.

No true humeral or caudal spots. A heavy black lateral stripe from the caudal peduncle to the head, much fainter over the region of the body-cavity. An almost straight black line from the caudal along the under side of the caudal peduncle to a point just above the origin of the anal. Last four scales of the back black. Fins all unmarked. Scales above the lateral stripe heavily outlined with dusky.

## 12. HOLLANDICHTHYS Eigenmann.

To William Jacob Holland.

*Hollandichthys* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.TYPE.—*Tetragonopterus multifasciatus* Eigenmann & Norris.Very similar to *Pseudochalceus*.

Maxillary long, slender, slipping under the preorbital for nearly its entire length, its upper anterior margin concave; premaxillary-maxillary border continuously curved and oblique; middle teeth of the premaxillary scarcely enlarged; dentary with four or five large equal teeth in front; maxillary with teeth along nearly its entire border; scales of sides deep, emarginate; lateral line incomplete.

HABITAT.—Southeastern Brazil.

This genus differs from *Pseudochalceus* in the teeth of the dentary, the scales, etc.

## HOLLANDICHTHYS MULTIFASCIATUS (Eigenmann and Norris).

Plate 2, fig. 4; Plate 64, fig. 1, 2, 4; Plate 95, fig. 8.

*Tetragonopterus multifasciatus* EIGENMANN & NORRIS, Revista Mus. Paulista, 1900, **4**, p. 358 (Cubatão).*Pseudochalceus affinis* STEINDACHNER, Anz. K. akad. wiss. Wien, 1908, no. 5, p. 29. (Rio Jaragua near Joinville).*Pseudochalceus perstriatus* RIBEIRO, Kosmos, 1908, no. 1 (Corregos de Iporanga, Santa Catharina).*Hollandichthys multifasciatus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—São Paulo and Santa Catharina, southeastern Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
9288 I. Cotypes	3	34-70 <sup>1</sup>	Cubatão	Von Ihering
2951 C.	2	40, 106	Iporanga	Haseman
2952 C.	18	49-107	Raiz da Serra, Rio Mogy	Haseman

Head 3.5; depth 2.66; D. 11; A. 28-31; lateral line 40; transverse 12; scales 6.5-40-3; 7-9 scales perforated; eye 3.25 in the head; interorbital 2.8.

Compressed, subrhomboidal. Preventral area rounded. Predorsal area rounded, with two somewhat irregularly placed series of scales, much smaller than the scales of the sides.

<sup>1</sup> To base of caudal.

Occipital process about 6 in the distance from its base to the dorsal, bordered by 3 or 4 scales on the side. Interorbital convex. Frontal fontanel half as long as the parietal and occipital process. Head pointed, its upper and lower profiles about equally divergent from the mouth. Second suborbital short and deep, leaving a narrow naked margin behind and a broader one below. Mouth large, terminal. Maxillary extending to the end of the preorbital, 2.5 in the head. Maxillary-premaxillary border without a distinct angle. Three small tricuspid teeth in the outer series of the premaxillary; five narrow tricuspid teeth in the second row, the middle one the longest, graduated slightly to the last, which is about twice as large as the largest maxillary tooth. Maxillary teeth tricuspid, close set at the upper part of the maxillary, more widely spaced toward the lower end. Dentary with four or five tricuspid teeth of about uniform size, the sides with about 10 abruptly minute teeth.

Gill-rakers about 8 + 12.

Scales eyeloid, with many parallel striae, those below the lateral line with short and deep exposed surfaces and emarginate edge, regularly imbricate except in front of the dorsal; scales of the preventral and predorsal areas small, a narrow sheath of a single series of scales along the base of the anal.

Origin of dorsal equidistant from snout and base of middle caudal rays. Origin of anal under middle of dorsal. Origin of ventrals more than an orbital diameter nearer snout than to the dorsal; ventrals reaching anal.

Color of back dark, of sides much lighter, with a series of 8 or 9 dark brown longitudinal lateral bands (between the rows of scales). A small, deep, brown spot on each scale of lower half of body. Basal half of adipose fin in adult black. Two vertical humeral spots, of which the posterior on the 6th, 7th, or 8th rows of scales is darkest; both indistinct in adult.

### 13. PSEUDOCALCEUS Kner.

*ψευδής* false, Chalceus, a genus of characins, from χαλκεος, ἦ, copper.

*Pseudochalceus* KNER, Sitzungsab. Akad. wiss. München, 1863, p. 225.

TYPE.—*Pseudochalceus lineatus* Kner.

Mouth large; premaxillary with two series of teeth, those of the outer series much smaller than those of the inner, the middle pair of the inner series much larger than the rest, each tooth with a large median cusp and a small lateral cusp on each side; maxillary with a single series of similar teeth along nearly its entire length. Mandible with a single series of irregularly graduated

teeth, the front four or five on each side being much larger than any of those of the upper jaw, the fourth tooth from in front being usually, though not always, somewhat the largest. Dorsal behind ventrals. Lateral line interrupted. Species with numerous longitudinal stripes.

Very similar to *Hollandichthys*.

HABITAT.—Western Ecuador.

#### PSEUDOCHALCEUS LINEATUS Kner.

Plate 64, figs. 3 and 5.

*Pseudochalceus lineatus* KNER, Sitzungsab. Akad. Wiss. München, 1863, p. 225; KNER & STEINDACHNER, Abhandl. Bayer. akad. Wiss., 1864, 10, p. 35, pl. 5, fig. 1 (Western slopes of Ecuador); EIGENMANN, Rept. Princeton Univ. Exped. Patagonia, 1910, 3, p. 432.

This species is known only from the types in the K. K. naturhistorisches Hofmuseum, Vienna, from which the generic description has been drawn. Wagner (Abhandl. Bayer. akad. Wiss., 1864, 10, p. 98) states that it occurs only at about 1000 feet elevation.

Head 3.5; depth 2.8–3; D. 10 or 11; A. 25 or 26; scales 36; eye 4 in the head, equal to snout, slightly less than interorbital.

Second suborbital covering nearly the entire cheek; origin of anal below end of dorsal; scales with 12–14 striae; lateral line developed on 6–8 scales; brownish, with darker stripes between rows of scales.

#### 14. ASTYANAX Baird and Girard.

ἄστυ-αἰαξ, ὁ, lord of the city. In Homer Astyanax, son of Hector.

*Tetragonopterus* in part by authors generally.

*Astyanax* BAIRD & GIRARD, Proc. Acad. Nat. Sci. Phil., 1854, 7, p. 26; U. S. & Mex. bound. surv., 1859, p. 74; EIGENMANN, Ann. Carnegie Mus., 1907, 4, p. 127 (*argentatus*).

*Poecilurichthys* GILL, Ann. Lye. Nat. Hist. N. Y., 1858, 6, p. 54 (*brevoortii*).<sup>1</sup>

*Zygogaster* EIGENMANN, Indiana Univ. Studies, 1913, no. 18, p. 23 (*filiferus*).<sup>2</sup>

TYPE.—*Astyanax argentatus* Baird & Girard.

Small, compressed fishes, more or less elongate, rarely reaching a length of 150 mm., usually much smaller, but in one instance, *A. maximus*, reaching 200 mm. in length.

Premaxillary with two series of teeth, the first series with several teeth;

<sup>1</sup> ποικιλία, variegated, οὐρα, tail, ἰχθύς, ὁ, fish.

<sup>2</sup> ζυγόν, τό, a yoke, γαστήρ, ἡ, the belly.

mandible with strong teeth in front, abruptly minute conical ones on the sides or more gradually very small ones on the sides, without conical teeth in a second series; teeth of second series of premaxillary equal or graduated, usually five in number, four in a few species; crowns of premaxillary and mandibular teeth usually ridged and denticulate; maxillary with a few or no (0-10) teeth; caudal naked; lateral line complete; gill-rakers setiform; no predorsal spine. Form usually slender, depth more than two in the length, except in *A. bimaculatus*, *A. lacustris*, and *A. alleni*.

There is considerable difference in the character of the teeth of the second row of the premaxillary. In some of the larger species the back of each tooth of the inner series is convex, the front hollowed, spoon-fashion, and the curved free margin is serrate, the median point strongest; the teeth of the lower jaw are the reverse of this and since the two series of teeth alternate with each other they form a zigzag cutting edge as the jaws are closed. The lower teeth pass behind the upper ones. In some species, probably in all the smaller species, the hollow of the teeth is sometimes reduced so that the teeth become simple, serrate incisors.

As here understood *Astyanax* is stripped of the forms having a scaled caudal, an incomplete lateral line, a combination of four teeth in the inner row of the premaxillary with a completely armed suborbital, and of those with the entire or nearly entire edge of the maxillary denticulate, all of which have until recently been associated with it under *Tetragonopterus*. It is divisible into a group without a complete series of scales between the dorsal and the occipital process which includes most of the deep-bodied, smaller scaled species (*Poecilurichthys*) and into a group of slenderer, sometimes minute, usually larger scaled species with a regular and complete series of scales between the occipital process and the dorsal (*Astyanax*).

*Astyanax* is one of the dominant genera of South America. At present it is found from Patagonia to the United States (New Mexico) and from tide-water to high up in the mountains. It is found on both slopes of the Cordilleras from Ecuador to Mexico. Two species are more conspicuous than the others on account of their wide distribution, *A. bimaculatus* from La Plata to Panama, and *A. fasciatus* from the Rio Negro, Patagonia to Mexico.

*Astyanax bimaculatus* is represented by more or less distinct varieties in different localities. Of special interest in the same respect is *A. fasciatus*. This species, so widely distributed, is absent from the Parahyba where it is replaced by a distinct species; it is also absent from other rivers where it has probably

also taken on forms considered specifically distinct; this species admirably shows the divergence of species with isolation in the rivers independently emptying into the Atlantic in eastern and southeastern Brazil and in Central America and Mexico. In the latter area it has given rise to a series of species or varieties, *A. mexicanus*, *A. macrophthalmus*, and *A. nicaraguensis*, distinguishable from each other but scarcely distinguishable from the independently originated varieties and species of southeastern Brazil.

In many cases the varieties are statistical, *i. e.*, while specimens of the two varieties cannot be distinguished, a large number of specimens from one locality are in the aggregate different from a large number of other specimens from another locality. The details are given under the respective species.

The genus shades in many directions into genera here treated as distinct.

There is considerable variation in the size of the mouth, from the small mouthed *A. alleni*, *A. pellegrini*, *A. festae*, etc. to *A. fasciatus*, *A. scabriceps*, and others that lead to the genus *Astyanacinus*. Similarly there is an irregular variation in the number of teeth in the maxillary from none to three or four or even ten. Of special interest is the variety *A. nicaraguensis*, in which the dentition of the maxillary shows a complete gradation from typical *Astyanax* to the species segregated as *Hemibrycon*. The caudal sheath is always small but here also in *A. taeniatus intermedius* there is an indication of a tendency toward *Moenkhausia*. In all the specimens of the species of *Astyanax* examined except *A. mutator* the lateral line was complete; in specimens of *Hemigrammus inconstans* the lateral line is complete in some and in others it is incomplete. On the other hand, of the hundreds of specimens of many other species of *Hemigrammus*, but one or two were found with a complete lateral line. The details are given under the respective species. In *A. festae*, *A. regani*, *A. albeolus*, some specimens of *A. metae*, and half the specimens of *A. rivularis* from the Rio San Francisco there were but four teeth in the inner series of the premaxillary, one of the characters distinguishing *Bryconamericus*. In *A. goyacensis*, *A. multidentis*, *A. gracilior*, and *A. paucidentis*, we have the entire cheek covered with the second suborbital, one of the other characters distinguishing *Bryconamericus*. In *A. taeniatus* the teeth of the sides of the lower jaw tend to become graduate, a condition leading to the distinguishing character of *Deuterodon*. In *A. alleni* the scales are ciliated and lead toward *Ctenobrycon*. The genus is thus seen to branch out in various directions, the ends of the branches being here considered as distinct genera.

*Key to the Species.*Subgenera: *Pocilurichthys* and *Zyggaster*.

- a. Lateral line 40-55, sometimes 38 in *abramis*.
- b. Anal rays 40-45; mouth very small; rows of scales below the lateral line, deflected toward anal; caudal spot not continued to end of caudal. (La Plata Basin).
- c. Lateral line 48-55.
- d. Depth 2.63; A. 45; lateral line 55; eye .66 in snout, .8-.83 in interorbital.
  - 1. *erythropterus* (Holmberg).
- dd. Depth 2-2.2; A. 40-45; lateral line 48-50; eye 1-1.1 in interorbital, 2.75 in head; interpolated rows of scales beginning above origin of ventrals.
  - 2. *alleni* (Eigenmann & McAtce).
- cc. Lateral line 42-50.
  - e. Depth 2.5-2.8; A. 41; scales 9 to 11-45 to 50-8; eye 1 in interorbital, 2.5-2.75 in head; interpolated scales above anal only. . . . . 3. *pellegrini* Eigenmann & Kennedy.
  - ee. Depth 2.5; A. 45; scales 8-42-7 or 8; eye 1.7 in interorbital, 3.7 in head.
    - 4. *correntinus* (Holmberg).
- bb. Anal rays 34-43. (Ecuadorian species).
  - f. Maxillary without teeth, about half as long as eye; two conspicuous humeral spots; no caudal band, the spot variable. Depth 2.5-3; A. 33-40; scales 8-41 to 47-8; eye 2.75 in head, equals interorbital in largest. . . . . 5. *festae* (Boulenger).
  - ff. Maxillary with two teeth, about half as long as snout and eye; a distinct humeral spot; depth 3; A. 41; scales 8-46-8; eye 2.5 in head. . . . . 6. *riveri* Pellegrin.
- bbb. Anal rays 22-34; mouth large; maxillary about equal to the eye.
  - g. No humeral spot; very few short auxiliary rows of scales above the anal; 2-4 striae on the scales above the lateral line; depth 2.7/11-3.3. (Upper Amazon).
  - h. Scales 11 or 12-54 or 55-9 or 10; A. 28-32; depth 3-3.33; a black spot on the base of the middle caudal rays, continued to the lower margin of the fin and to near the tips of the middle rays. . . . . 7. *asymmetricus* Eigenmann.
  - hh. Scales 8-48-6; A. 30; depth 2.7/11; a caudal spot continued on the middle caudal rays. . . . . 8. *symmetricus* Eigenmann.
  - gg. A round humeral spot over the 7th-9th scales of the lateral line; depth 2-2.5; A. 27-31; lateral line 42-46; interorbital very convex. (Guiana). . . . 9. *polylepis* (Günther).
  - ggg. A faint vertical humeral spot over the 3d scale of the lateral line. Depth 2.7-3; scales 8 or 9-42 to 47-5 or 6; A. 27-30; eye 2.56; 2-11 striae on the scales above the lateral line; a black or dark bar across the base of the caudal, continued on the middle caudal rays. . . . . 10. *zonatus* Eigenmann.
  - gggg. A well-defined horizontally or vertically oval humeral spot.
    - i. Caudal spot not continued to the end of the rays; no spot on caudal peduncle; silvery band narrow and faint.
    - j. Scales 12-53-9; A. 31; humeral spot horizontally ovate over and in part on the first five scales of the lateral line; caudal spot small, well defined; lower fins blackish. . . . . 11. *bourgeti* Eigenmann.
    - jj. Scales 9 to 11-43 to 51-7; A. 28-30; humeral spot narrowly ovate, horizontal, over the first five scales of the lateral line, caudal spot large diffuse.
      - 12. *abramoides* Eigenmann.
  - ii. Caudal spot continued to the end of the middle rays.
    - k. Depth 2.8; humeral spot sublinear, over the origin of the lateral line; scales 10-52 or 53-6; A. 28-32; scales not deflected toward the anal.
      - 13. *anterior* Eigenmann.
    - kk. Depth 2-2.3; humeral spot oval; a broad spot on caudal peduncle, tapering forward; scales 7 to 10-38 to 49-6 or 7; A. 30-34.
      - 14. *abramis* (Jenyns).
- aa. Scales 40, or fewer, except rarely 41, in *A. bimaculatus*, *A. caucanus*, and *A. stilbe*.
  - l. A well-defined circular or horizontally oval humeral spot; A. 21-41; scales 31-41.
  - m. Depth less than 3 in the length.



- n.* Humeral spot horizontally ovate; anal rays less than 36 in all but *A. borealis*.
- o.* Denticles of each tooth of the inner series of the premaxillary arranged in a crescent or U-shaped line.
- p.* Depth 1.9-2.5; some interpolated series of scales over the anal muscles; pectorals reaching slightly beyond origin of ventrals.
- q.* Scales 31-41.
- r.* Anal rays 36-39; scales 39-40.
  - 16. *bimaculatus borealis* Eigenmann.
- rr.* Anal rays 26-36 (most frequently 30 or 31).
- s.* No series of lateral spots. . . . . 15. *bimaculatus* (Linné).
- t.* Series of spots along rows of scales.
  - 17. *bimaculatus paraguayensis* Eigenmann.
- qq.* Scales 32-36; A. 21-38; depth in the adult 1.9-2.2.
  - u.* Series of spots along the rows of scales.
    - 18. *bimaculatus vittatus* (Castelnau).
  - uu.* Lateral band silvery; no spots along rows of scales.
    - 19. *bimaculatus lacustris* (Lütken).
  - uuu.* Lateral band black; no spots along rows of scales.
    - 20. *bimaculatus norae* Eigenmann.
- pp.* Depth 2.7-2.83; pectorals not reaching ventrals; no interpolated series of scales; base of anal equal to distance between the dorsals.
  - v.* Check with  $\frac{1}{2}$  of its width naked; two maxillary teeth; snout pointed; predorsal area entirely scaled, with an almost complete series of median scales; scales above the anal with rarely more than 2 striae . . . 21. *junciroensis* Eigenmann.
  - vv.* Check entirely covered by the second suborbital; one maxillary tooth; snout blunt, rounded; scales above the anal with four or more striae.
    - 22. *goyacensis* Eigenmann.
- oo.* Teeth of the inner series of the premaxillary alike in front and behind, the denticles arranged in a nearly straight line;
  - w.* Scales 7-37 to 41-6; maxillary with one to three teeth, extending to below origin of pupil; depth 2.4; head 4; eye a little more than 3 in head. A. 30-33. . . 23. *orthodus* Eigenmann.
  - ww.* Scales 8 (rarely 9)-37 to 39 (rarely 41)-6 or 7. A. 27 or 28, rarely 29. Humeral spot blended with a vertical band.
    - 24. *potaroensis* Eigenmann.
- nn.* Humeral spot very conspicuous, circular or vertically elongate, pre-ventral area compressed, with a series of very small median scales, the scales bordering them with the lower (median) margin truncate, or two or three series of small scales; series of scales below the lateral line decurrent. . . . . (ZYGOGASTER).
- x.* Second suborbital not in contact with the preopercle below.
  - y.* Anal rays 36-41. A silvery lateral band. Dorsal a little behind the origin of the ventrals; the anterior anal rays elongate. Maxillary extending to near the anterior margin of the eye. Depth 2.4-2.8; head 3.5; scales 8-37 to 40-10.
    - 25. *stilbe* (Cope).
  - yy.* Anal rays 33 or 31; depth 2.33.
    - 26. *mugilalenae* Eigenmann and Henn.
- xx.* Second suborbital in contact with the opercle below.

- z. Dorsal and ventrals in the male not filamentous; origin of the anal in the male nearer the base of the last anal ray than to the origin of the dorsal; anal rays 37-42;

- A. Depth 1.9-2.2, ..... 27. *atratoensis* Eigenmann.  
 A.A. Depth 2.33-3, ..... 28. *caucanus* (Steindachner).  
 zz. First dorsal and outer ventral rays filiform in the male; origin of anal nearer origin of dorsal than base of last anal ray in the male; depth in the male 3, in the female 2.5; A. 38 or 39; lateral line 38 or 39.  
 29. *filiferus* (Eigenmann).

# 1. ASTYANAX (POECILURICHTHYS) ERYTHROPTERUS (Holmberg).

*Tetragonopterus erythropterus* HOLMBERG, Revista Arg. nat. hist., 1891, **1**, p. 189 (Paraná; Buenos Aires).

*Astyanax erythropterus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Paraná; Buenos Aires.

Known only from the types.

Head 3.6; depth 2.63; D. 11; A. 45; scales 12-55-11; eye .66 in snout, .8-.83 in interorbital.

Profile concave over posterior part of eye, rising in a curve to the dorsal; ventral profile a curve to origin of anal, rising obliquely along entire base of anal.

"Blanco plateado, por arriba un poco amarillento y algo verdoso, salpicado de fina y diminuta irroracion negra que se sigue las oblicuidades de las lineas internusculares; tales puntos se hallan mas esparcidos en los radios. Ojo auricálico; aletas pares claras, impares de un rojo vivisimo, casi vermellon." Holmberg.

# 2. ASTYANAX (POECILURICHTHYS) ALLENI (Eigenmann and McAtee).

Plate 32, fig. 3.

*Tetragonopterus alleni* EIGENMANN & MCATEE, Ann. Carnegie mus., 1907, **4**, p. 127, pl. 40, fig. 2 (Corumbá; Rio Otuquis; Asuncion).

*Ctenobrycon alleni* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

HABITAT.—Paraguay Basin.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10158 I. Type	1	93 <sup>1</sup>	Corumbá	Anisits
10159 I.	1 ♀	71 <sup>1</sup>	Corumbá	Anisits
10160 I.	1	74 <sup>1</sup>	Rio Otuquis	Anisits
10161 I.	2 ♂	58 <sup>1</sup> , 73 <sup>1</sup>	Asuncion	Anisits

<sup>1</sup> To base of caudal.

Most closely related to *Ctenobrycon hauxwellianus*, but with a naked predorsal line, the young more slender, the scales on the sides below the lateral line less regularly arranged. This species is evidently the southern modification of *C. hauxwellianus*.

Head about 4; depth 2-2.2; D. 11; A. 40-45; scales 11-48 to 50-8; eye 2.75; interorbital 2.5, in the largest 2.75.

Compressed, elongate; ventral profile from snout to end of anal, a nearly regular arc of a circle with a diameter of a little more than half the length; dorsal profile equally arched but the outline less regular, being, with age, increasingly humped in the nape. Preventral area rounded, without a median series of scales; postventral area bluntly keeled. Predorsal area bluntly keeled, with a double series of half scales which do not meet over the back; 7-9 scales along either side of the occipital process.

Occipital process about one third of the distance from its base to the dorsal. Frontal fontanel more than half the length of the parietal which is continued as a groove to the tip of the occipital process. Interorbital convex. Second suborbital leaving a naked area of equal width around its entire free margin. Mouth minute, the maxillary very convex in front, nearly vertical, its length equals that of snout in medium sized specimens, less than snout in the largest, 4-5 in the head; four or five teeth in the front row of the premaxillary, five in the second row; a single, broad tooth on the maxillary.

Gill-rakers 10 + 17, the longest not equal to one third the length of the eye.

Scales ciliate in the adult, entire in the young, with numerous radiating striae, regularly imbricate but irregular in size above the lateral line. Lateral line nearly straight, the row of scales below it dicotomously branched above the origin of the ventrals, the main row being apparently deflected; other rows similarly branched. The rows of scales above the front of the anal are all oblique; from above the second third of the anal, there are two or three series of scales parallel with the lateral line; scales becoming smaller backward; the ventrals and origin of anal, being equally removed from the lateral line, have respectively 9 and 14 rows of scales or 8 and 13. Anal sheath continued with the scales of the sides, of three rows of scales. Caudal naked; a large axillary scale.

Origin of dorsal equidistant from tip of snout and base of caudal or a little nearer the latter; dorsal pointed, its rays rapidly and regularly graduate, the highest three in the length, the penultimate not much more than one third the length of the highest. Origin of anal and base of last or middle dorsal ray equidistant from snout, its margin nearly straight; fifth to seventh scale in front of dorsal and ventrals equidistant from tip of snout, reaching to anal in young

but falling short in the adult; pectorals reaching beyond origin of ventrals but not to tip of axillary scale.

A narrow, silvery lateral band, an obscure vertical humeral spot and a similar caudal spot.

Vertebrae 11 + 22.

Second air-bladder oblique conical, tapering abruptly into a vermiform appendage, its entire length not twice that of the anterior air-bladder, its diameter rather greater than the diameter of the eye, one half of its length exclusive of the appendage. Alimentary canal about equal to the entire length, filled with bivalves in the one dissected.

The humping of the nape in this species as well as in *A. haurwellianus*, is caused in part by the development of a large adipose body in the space between the occipital crest and the musculature of the dorsal fin. The specimens were first preserved in formalin and it may be that the feeble denticulation of the scales is due to the action of the preservative and that this species is congeneric with *A. haurwellianus*.

3. *ASTYANAX* (*POECILURICHTHYS*) *PELLEGRINI* (Eigenmann and Kennedy).

Plate 40, fig. 5.

*Poeciliurichthys multiradiatus* EIGENMANN & KENNEDY, (non *Tetragonopterus multiradiatus* Steind.), Proc. Acad. nat. sci. Phil., 1903, p. 521 (Asuncion).

*Astyanax multiradiatus* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 29 (Paraguay).

*Astyanax pellegrini* EIGENMANN & KENNEDY, Ann. Carnegie mus., 1907, 4, p. 136, pl. 40, fig. 3 (Bahia Negra); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Paraguay Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10246 I. Type <sup>1</sup>	1 ♂	68 <sup>3</sup>	Bahia Negra	Anisits
10245 I. <sup>1</sup>	1 ♀	77 <sup>3</sup>	Bahia Negra	Anisits
10014 I. <sup>1</sup>	1	29-67 <sup>3</sup>	Asuncion	Anisits
10013 I. <sup>1</sup>	1			
10014 I. <sup>1</sup>	2			
10017 I. <sup>1</sup>	1			
10053 I.	1			
3322 C. <sup>2</sup>	12		Asuncion	Haseman
3323 C.	8		Villa Hays	Haseman
3340 C.	7	57-80	Corumba	Haseman
3341 C. <sup>2</sup>	12	28-74	Corumba	Haseman

<sup>1</sup> Anal rays. . . . . 42      10      10      12      12      42  
<sup>2</sup> Depth in the length . . . . . 2.2      2.3      2.4      2.25      2.6      2.2  
<sup>3</sup> To base of caudal.

Allied to *A. alleni*, much slenderer and the scales of the lower sides regularly imbricate except over the muscles of the anal.

Head 4.25; depth 2.5 in 10,245 (female);  $2\frac{5}{8}$  in 10,246 (male); D. 11; A. 41-45; scales 9 to 11-45 to 50-8; eye 2.5-2.75, interorbital equals eye.

Elongate compressed, the dorsal and ventral profiles equally arched in the male, without humps or depressions; in the female the ventral profile is deeper than the dorsal, and regular, the dorsal profile somewhat humped at the occiput. Preventral area narrowly rounded, without a regular median series of scales; postventral area narrowly compressed. Predorsal area keeled, naked except just in front of the dorsal where the scales of one side sometimes have a narrow margin bent over the back; about six scales bordering the occipital process on the side.

Occipital process 3 to 4 in the distance from its base to the dorsal, being longer in the deep specimens; occipital fontanel nearly twice as long as the frontal and continued as a groove to the tip of the occipital process. Interorbital convex. Second suborbital, as in *A. alleni*, leaving a narrow naked area around its free margin. Mouth small, anterior margin of maxillary much arched, its upper part vertical, equal to the snout or shorter, 4.2-4.5 in the head. Mandible 2.75 in head. Five teeth in the outer series of the premaxillary, the third removed from the line; five teeth in the inner series, the points of the middle ones, at least arranged in a U-shaped series. Four graduated asymmetrical teeth and a number of small ones on the dentary. Maxillary with a single tooth.

Gill-rakers 10+16, longest equal to about one third the diameter of the eye.

Scales very feebly ciliate, rather irregularly imbricate, there being small and large scales, rows regular without interpolated series except over the anal musculature. Lateral line but little decurved, the row of scales below it parallel with it; a variable axillary scale. Caudal naked. Anal with a low sheath of two or three series of scales.

Origin of dorsal usually a little nearer snout than base of caudal; dorsal pointed, its height 3-3.33, in the length. Origin of anal and base of middle dorsal ray equidistant from tip of snout; anterior anal rays higher but the margin nearly straight. Ventrals reaching anal. Pectorals considerably beyond origin of ventrals; origin of ventrals and 7th scale in front of the dorsal about equidistant from tip of snout.

A silvery, lateral band, narrowed on the caudal peduncle and interrupted in front by a vertical humeral spot; humeral spot bordered in front and behind by a pigmentless area, that behind bordered on its part by a faint second humeral

spot; an obscure spot on end of caudal peduncle, not continued to the end of the middle rays and not evident in alcoholic specimens; humeral spot faint in alcoholic specimens.

Vertebrae 12+22.

Second air-bladder much curved, ending in a point,  $1\frac{3}{5}$  times as long as the anterior, its greatest vertical diameter nearly one half the length of the head. Alimentary canal equal to the entire length, containing in part plant-filaments.

It is possible that *A. (Tetragonopterus) correntinus* and *A. erythropterus* Holmberg are related to this species though it is impossible to say from the brief description.

#### 4. ASTYANAX (POECILURICHTHYS) CORRENTINUS (Holmberg).

*Tetragonopterus correntinus* HOLMBERG, Revista Arg. nat. hist. 1891, **1**, p. 188 (Corrientes, Rio Paraná).  
*Astyanax correntinus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Paraná.

Known only from the types. It is possible that it is *A. pellegrini*.

The following is the original description of this species:—

D. 11; A. 45; V. 8; L. lat. 42; L. tr. 8.7-8; depth 2.5; head 3.7; eye 3.7; interorbital 2.6.

Long. (sin caudal).....	90	mm.
Altura.....	36	mm.
Ancho.....	11	mm.
Long. de la cabeza.....	21	mm.
Diametro ocular.....	6.5	mm.
Nocio.....	5	mm.
Distancia interorbitaria.....	11	mm.

Lanceolado: el perfil superior se deprime en línea cóncava sobre el ojo y luego sube en curva hasta la aleta dorsal, decliva luego en la base de esta y entónces corre hácia la caudal con una lijere convexidad; el perfil inferior es una curva continua que termina en el ápice de la anal. El ápice de los radios ventrals queda debajo del nacimiento de la dorsal. La altura es mayor que el tercio del largo (sin caudal). Plateado, en lo superior un poco oscuro por irroración parda muy fina. Aletas claras, la dorsal un poco oscura; pectoral pardusca en su mitad superior; una mancha parda en la base de la caudal.

Patria: Republica Argentina, Corrientes. Rio Paraná. Descubierto por Solari en IV, 1885. Holmberg.

#### 5. ASTYANAX (POECILURICHTHYS) FESTAE (Boulenger).

Plate 40, fig. 4. Plate 95, fig. 5.

*Tetragonopterus festae* BOULENGER, Boll. Mus. univ. Torino, 1898, **13** (Rio Vinces); STARKS, Proc. U. S. N. M., 1906, **30**, p. 776 (Mirador, Ecuador).

*Astyanax festae* EIGENMANN, Rept. Princeton univ. Exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Western Ecuador.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5429 C.	Many		Vinces	Henn
5430 C.	Many	76 <sup>1</sup>	Colimes, Rio Daule	Henn
5431 C.	Many	71 <sup>1</sup>	Puertoviejo	Henn
5432 C.	1	78	Rio Chan Chan, Naranjito	Henn
9587 <sup>2</sup>	10	39-64	Mirador	Simons
13117 I.	Many		Vinces	Henn
13118 I.	Many		Colimes, Rio Daule	Henn
13119 I.	Many		Puertoviejo	Henn
13120 I.	1	78	Rio Chan Chan, Naranjito	Henn
13580 I.	1	51	Chone, Prov. Manabi	Henn

Head about 4; depth about 2.5; D. 11; A. 33-40; scales 8-41 to 48-7 or 8; eye 2.75-3 in the head, equal to the interorbital in the largest; less than interorbital in the smaller.

Compressed, subrhomboidal, elongate; head bluntly subconical. Pre-ventral area narrowly rounded, the median series of scales not quite regular; postventral area narrowly keeled. Predorsal area bluntly keeled; the median line largely naked in the adult, about 17-20 scales between the dorsal and occipital process along one side of the median line.

Occipital process about one fifth of the distance from its base to the dorsal, bordered by about 5 scales; profile slightly depressed. Interorbital rounded. Frontal fontanel two thirds the length of the parietal without the occipital groove. Second suborbital leaving one fourth or less than one fourth the width of the cheeks naked. Mouth very small. Maxillary not much more than half the length of the eye, nearly vertical, not reaching the eye. Mandible equals the eye in length; three to five teeth in the outer row of the premaxillary, four very broad teeth in the inner row, their denticles arranged in distinct crescents. No maxillary teeth. Dentary with four larger graduate teeth (those of the two dentaries arranged in a distinct crescent) and one or two smaller ones scarcely evident; no teeth in side of lower jaw, the dentiferous ridge raised, scale-like at its end.

Gill-rakers 10 + 12, about equal to posterior nostril.

Dorsal a little nearer caudal than tip of snout, obliquely truncate, its longest ray 4 in the length. Origin of anal under middle of dorsal, its border but little emarginate. Ventrals scarcely reaching anal, their origin under the

<sup>1</sup> Largest specimen.

<sup>2</sup> Leland Stanford Jr. University Collection.

9th scale in front of the dorsal, equidistant from tip of snout and the origin of the last third of the anal. Pectorals reaching about to end of the well-developed axillary scale.

Lateral line nearly straight; scales with but few widely diverging striae, regularly imbricate except over the anal where a few interpolated rows cause the regular rows to be deflected toward the anal.

Anal sheath of a single series of scales.

Dusky above, silvery below; two well-marked vertical humeral spots over the fourth and fifth and over the tenth and twelfth scales of the lateral line, the second spot usually the larger; a silvery lateral band which ends in a dark caudal spot which becomes diffuse on the caudal, never a median caudal band.

#### 6. *ASTYANAX* (*POECHILURICHTHYS*) *RIVETI* Pellegrin.

Plate 40, fig. 3.

*Astyanax riveti* PELLEGRIN, Bull. Mus. hist. nat., 1907, **13**, p. 25 (Rio Pove); EIGENMANN, Rept. Princeton univ. expd. Patagonia, 1910, **3**, p. 432.

*Tetragonopterus (Astyanax) riveti* PELLEGRIN, Mission Equateur, 1912, **9**, B. 7, pl. 1, fig. 1.

HABITAT.—West slope of the high Andes of Ecuador.

TYPE, a specimen 80 mm. in the Mus. his. nat. Paris. Rio Pove, Santo Domingo de los Colorados, Ecuador, 560 meters d'altitude. Rivet.

The account in the key is drawn from the type which I was able to examine through the courtesy of Dr. Pellegrin. In the shape of the mouth this species approaches *A. asymmetricus*, *A. symmetricus*, *et al.*

It is very probable that this is a synonym of *Bryconamericus brevirostris* (Günther).

#### 7. *ASTYANAX* (*POECHILURICHTHYS*) *ASYMMETRICUS* Eigenmann.

Plate 41, fig. 2.

*Astyanax asymmetricus* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 94; Rept. Princeton univ. expd. Patagonia, 1910, **3**, p. 432.

HABITAT.—Tabatinga.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20766 Type	1	51	Tabatinga	Bourget
20763	2	40, 45 about	Tabatinga	Bourget



Distinguishable from all other members of the genus by the triangular, asymmetrically placed caudal spot.

Head 3.3–3.7; depth 3–3.3; D. 11; A. 30, 32, 28; scales 11 or 12–54 or 55–9; eye 2.5–2.75 in the head; interorbital 3.1–3.75.

Compressed, symmetrically elliptical to the slender caudal peduncle. Pre-ventral area flattened, with a distinct median series of scales for at least part of the length; postventral area compressed to an edge. Predorsal area compressed, without a median series of scales, the scales of the sides not bent over the ridge, which is naked.

Occipital process about one fourth the distance of its base from the dorsal, bordered by about 6 scales on each side. Frontal fontanel but little shorter than the posterior, exclusive of the groove on the occipital process. Interorbital but little convex. Second suborbital quite or nearly in contact with the vertical limb of the preopercle behind, but leaving a considerable naked area below. Snout long and pointed. Maxillary long and slender, about as long as the eye. Three or four teeth in the front row of the premaxillary, if four the third removed from the line; five teeth in the second series, the denticles arranged in a nearly straight line. Two very minute teeth on the maxillary. Dentary with four slightly graduate teeth and a number of smaller ones. Mandibles half the length of the head.

Gill-rakers slender, a little more than one third diameter of eye, about 8 + 14.

Scales small, cycloid, with numerous concentric lines but few radial striae, everywhere very regularly but not deeply imbricate, of nearly uniform size; caudal naked. Anal sheath composed of a single series of caducous scales. Lateral line little decurved, the row of scales below it parallel with it; no interpolated scales even over the anal muscles; axillary scale well developed.

Origin of dorsal a scarcely perceptible distance nearer tip of snout than base of caudal, pointed, its highest ray about 3.5 in the length. Caudal lobes a little longer than the highest dorsal ray. Anal emarginate, the highest ray about 6 in the length; the 12th ray about half the length of the highest; origin of anal and base of last dorsal ray equidistant from tip of snout. The ventrals reaching anal, scarcely nearer tip of snout than to the base of the first dorsal ray.

All but the tips of the middle caudal rays black, the spot continued obliquely downward on the end of the caudal peduncle to its lower edge, otherwise immaculate.

## S. ASTYANAX (POECILURICHTHYS) SYMMETRICUS Eigenmann.

Plate 41, fig. 1.

*Astyanax symmetricus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 95; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

One specimen 20768 in part. TYPE. 74 mm. Tabatinga. Bourget.

Allied to *A. asymmetricus*, *A. anterior* and *A. zonatus*. Distinguished by the absence of a humeral spot and the nearly symmetrical caudal spot. Most nearly like *A. zonatus*, from which it differs, among other things, by the striation of its scales.

Head 2.66; depth 2.63; D. 11; A. 30; scales 8-48-6; eye 3; interorbital 2.66.

Symmetrically elliptical to the caudal peduncle, compressed. Preventral area rounded, without a continuous median series of scales; postventral area keeled. Predorsal area narrow, completely scaled, but without a median series of scales.

Occipital process narrow,  $4\frac{3}{4}$  in the distance from its base to the dorsal, bordered by 4 scales on the sides. Frontal fontanel not much shorter than the posterior exclusive of the occipital groove. Second interorbital leaving a naked area which is widest below. Maxillary equal to the eye. Premaxillary with four teeth in the front row, of which the third is slightly withdrawn from the line; five graduated teeth in the second row, their denticles arranged in a crescent; maxillary with a single small tooth; lower jaw with three large, multicuspid graduate teeth and about eight small ones on the side. The first and second of the lateral teeth may be 2-pointed, the rest are retrorse conical, grading from in front back, the first abruptly smaller than the anterior teeth but larger than the following ones.

Gill-rakers 10 + 15, about one third the length of the eye.

Scales cycloid, regularly imbricate, an interpolated row between the second and third or third and fourth series below the lateral line, above the second fourth of the anal. Lateral line but little decurved, the row of scales below it parallel with it, each scale with 2-4 radiating striae; axillary scale well developed.

Origin of dorsal equidistant from tip of snout and base of upper caudal lobe; the fin pointed, its highest ray about 4 in the length. Anal emarginate, its origin and the base of the last dorsal ray equidistant from the snout. Ventrals just

reaching anal, their origin and the third scale in front of the dorsal equidistant from the snout. Pectorals reaching the ventrals.

Brassy; a silvery lateral band; no trace of a humeral spot; middle caudal rays dark, the chromatophores scattered over the base of the neighboring rays.

### 9. ASTYANAX (POECILURICHTHYS) POLYLEPIS (Günther).

Plate 54, figs. 3 and 5.

*Tetragonopterus polylepis* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 320 (British Guiana); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 276; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432; Mem. Carnegie mus., 1912, **5**, p. 356, pl. 41, figs. 2, 3.

HABITAT.—Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1415 C., 11791 I.	10	49–85	Crab Falls, Essequibo River	Eigenmann
1416 C.	1	44	Wismar, Demerara River	Eigenmann
1417 C., 11790 I.	10	38–52	Gluck Island, Rockstone	Eigenmann
1418 C., 11789 I.	19	35–53	Rockstone, Essequibo River	Eigenmann
1419 C., 11792 I.	9	50–85	Tumatumari, Potaro	Eigenmann

Readily distinguished by its circular spot over the 7–9 scales of the lateral line and its small scales.

Head 3.5–4; depth 2 in the largest, 2.6 in the young; D. 11; A. 27–31<sup>1</sup>; scales 10–42 to 46<sup>2</sup>–7 to 9 to ventrals; eye 3, interorbital 2.3 in the length of the head.

Much compressed, very deep in adults, the ventral profile pendant, the dorsal regularly arched from the snout to the caudal peduncle; much more slender in the young but maintaining the same ratio of curvature between the back and belly. Preventral region narrowly rounded, the pectorals considerably above the lower edge of the breast, scales of belly irregularly imbricate; postventral area narrowly compressed; entire back very narrow, not especially keeled. Predorsal area naked to near the dorsal where there are a few median scales or a few of the scales of one side lapping over the back.

Occipital process one fourth of the distance from its base to the dorsal.

<sup>1</sup> Günther gives the anal as 31 in the type. In twenty specimens examined two have 27 rays, four have 28, eight have 29, four have 30 and two have 31.

<sup>2</sup> In sixteen six have 42, six have 43, two have 44, one has 45 and one 46.

bordered on the sides by 5 scales; skull smooth, very convex. Frontal fontanel shorter than the parietal, extending to above the anterior margin of the pupil. Margin of second suborbital very convex, leaving but a narrow naked area. Maxillary 2.66 in the head. The mouth large. Four to six teeth in the front row of the premaxillary, the third withdrawn from the line with the rest; five teeth in the second series, their denticles in a straight line; eight large teeth in the lower jaw (four on each side) arranged in a crescent; small teeth on the side.

Scales of the sides and back regularly imbricate, a few interpolated scales over the anal muscles; a row of about 12 scales forming a sheath along the base of the anterior anal rays. Scales of belly and breast not very regularly arranged; lateral line but little decurved; axillary scale well developed.

Dorsal equidistant with the ventrals from the snout, its origin a little in advance of the middle, its highest ray  $3\frac{1}{2}$  in the length. Anal emarginate. Ventrals not reaching anal. Pectorals slightly beyond the origin of ventrals.

Highly iridescent; a round spot over the 7th–9th scales of the lateral line with a dark streak extending down from it and another curving upward and forward, surrounded by a light court; sides and fins thickly punctated especially in a lateral band on a level with the humeral spot. Tip of first anal ray sometimes milk-white.

#### 10. *ASTYANAX (POECILURICHTHYS) ZONATUS* Eigenmann.

Plate 41, fig. 3.

*Astyanax zonatus* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 95; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Tabatinga.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20768 in part Type	1	59	Tabatinga	Bourget
20768 in part	2	38, <sup>1</sup> 52 <sup>1</sup>	Tabatinga	Bourget
20753	2	37, <sup>1</sup> 40 <sup>1</sup>	Tabatinga	Bourget
20766 in part	1	34	Tabatinga	Bourget

Allied to *A. anterior* and *A. asymmetricus*; distinguishable from other members of the genus by its cross-bar-like caudal spot.

<sup>1</sup> To base of caudal.

Head 3.8; depth 3; scales 8 or 9-42 to 47-5 or 6; D. 11; A. 27-30; eye 2.56 in head; interorbital about equal to the eye.

Compressed, elongate, regularly elliptical to the base of the caudal peduncle. Preventral area rounded or flattish, without a median series of scales; post-ventral area keeled. Predorsal line feebly keeled, naked in front, some of the scales near the dorsal with their edges bent over the back and sometimes a median scale.

Occipital process equal to one fifth the distance of its base from the dorsal, bordered on the side by about 4 scales. Interorbital about equal to the eye, convex. Frontal fontanel not much shorter than the parietal, exclusive of the groove on the occipital process. Second interorbital bearing a naked area which is widest below. Premaxillary with four teeth in the front series, the second tooth removed from the line of the rest; second row with five teeth, their denticles arranged in a curved line. Maxillary with two minute teeth; lower jaw with four large teeth and a number of abruptly smaller ones of which the first three may be 3-pointed.

Gill-rakers about  $8 + 15$ ,  $\frac{1}{3}$  the diameter of the eye.

Scales cycloid, regularly imbricate, the rows not deflected to the anal and no auxiliary rows; each scale with several (2-11, usually 6-10) scarcely diverging striae. Caudal naked. Anal with a feeble sheath of a single row of caducous scales. Lateral line forming a downward curve to above the anal, the row of scales below it parallel with it for its entire length; axillary scale small.

Origin of dorsal a little in advance of middle of body, pointed, the next to the last ray nearly half as long as the highest, which is  $3\frac{3}{4}$  in the length. Caudal lobes slightly longer than the longest dorsal ray, the lower lobe a little the longer. Anal emarginate, the 10th ray about half as long as the longest; origin of anal and base of last dorsal ray equidistant from tip of snout. Ventrals scarcely reaching anal, their origin and the 3d scale in front of the dorsal equidistant from tip of snout. Pectorals reaching ventrals.

A faint, vertical humeral spot, a spur of it crossing the third scale of the lateral line; end of caudal peduncle whitish, a broad, dark bar crossing the base of the caudal, blackest in the center where it is continued to the end or to near the end of the middle rays. A narrow, silvery, lateral band.

Vertebrae  $13 + 19$ .

Anterior air-bladder two thirds as long as the posterior; the posterior sausage-shaped, but little decurved behind and ending bluntly.

Alimentary canal not quite equal to the entire length.

11. *ASTYANAX* (*POECILURICHTHYS*) *BOURGETI* Eigenmann.

Plate 40, fig. 1.

*Astyanax bourgeti* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 95; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

One specimen. 20768 part Type. 92 mm. Tabatinga. Bourget.

A well-marked species, differing from all others in the genus in its black lower fins.

Head  $3\frac{1}{3}$ ; depth  $2\frac{1}{3}$ ; D. 11; A. 34; scales 12-53-9; eye a little less than one third of the length of the head; interorbital 2.47.

Compressed; ventral profile regularly arched to the caudal peduncle; dorsal profile descending from the origin of the dorsal in both directions, anterior profile more arched above, depressed over the eye. Preventral area rounded, without a median series of scales, postventral area compressed. Predorsal line probably naked to near the dorsal.

Occipital process one fourth of the distance from its base to the dorsal, bordered by about 5 scales. Interorbital broad, smoothly arched but not greatly elevated. Anterior fontanel not much shorter than the posterior, exclusive of the groove on the occipital. Second suborbital leaving a rather wide naked area. Snout pointed. Maxillary equals length of eye. Mandible  $2\frac{1}{3}$  in head. Five 3-pointed teeth equidistant from each other in the front series of the premaxillary, the middle one somewhat withdrawn from the line, six teeth in the second row, their denticles in a nearly straight line. Maxillary with two minute teeth on one side and three on the other; five graduated teeth on each side of the lower jaw, followed by a series of minute teeth.

Scales regularly imbricate except over anal and the preventral region; three series of scales below the lateral line parallel with it, some interpolated rows below the third row above the anal; lateral line but little decurved.

Origin of dorsal equidistant from tip of snout and caudal, its highest ray about one fourth of the length. Origin of anal and base of last dorsal ray equidistant from tip of snout; base of anal equals distance of dorsal from caudal. Origin of ventrals and a point equal to two thirds of the base of the dorsal in front of the first ray equidistant from the tip of the snout and last but 7th anal ray. Ventrals reaching base of fourth anal ray. Pectorals to the fourth row of scales behind the origin of the ventrals.

A large, well-defined, horizontally ovate humeral spot on upper part of the

1st to 5th scales of the lateral line, and above those scales a conspicuous, silvery spot on its upper anterior corner; a narrow, faint, silvery band; a conspicuous black spot, about as large as the pupil on the base of the middle caudal rays; tips of middle half of caudal rays dusky; anal nearly uniformly dark; pectorals and ventrals profusely dotted, nearly black.

## 12. ASTYANAX (POECILURICHTHYS) ABRAMOIDES Eigenmann.

Plate 54, fig. 2.

*Tetragonopterus abramis* GÜNTHER (non Jenyns), Cat. fishes Brit. mus., 1864, **5**, p. 321 (British Guiana, Essequibo); STEINDACHNER, Flussf. Südamer., 1879, **1**, p. 18 (Orinoco, near Ciudad, Bolivar).  
*Astyanax abramoides* EIGENMANN, Ann. Carnegie mus., 1909, **6**, p. 121; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432; Mem. Carnegie mus., 1912, **5**, p. 357, pl. 52, fig. 4.

HABITAT.—Venezuela and Guiana.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1028 C. Type.	1	112	Tumatumari, Potaro River	Eigenmann
1029 C., 11,727 I.	86	48-112	Tumatumari, Potaro River	Eigenmann
Paratypes				
1030 C., 11,728 I.	2	99, 126	Potaro Landing	Eigenmann
1031 C., 11,729 I.	27	60-126	Kangaruma, Lower Potaro River	Eigenmann
1032 C., 11,730 I.	48	56-108	Amatuk Cataract, Potaro River	Eigenmann
1033 C.	1	54	Rockstone, Essequibo River	Eigenmann
1034 C.	1	46	Gluck Island, Rockstone	Eigenmann
1035 C., 11,731 I.	2	56, 63	Wismar, Demerara River	Eigenmann
1036 C., 11,732 I.	3	51-64	Christianburg, Demerara River	Eigenmann

Closely allied to *A. anterior* and *A. abramis* differing in the color of the caudal peduncle and caudal in both.

Head 4; depth 2.4-2.5; D. 11; A. usually 28<sup>1</sup>; scales 9 or 10-43 to 51<sup>2</sup>-7 or 8; eye 2.5-3; interorbital 2.5-2.6.

Elliptical, dorsal, and ventral outlines similar, without prominent humps, the profile slightly depressed over the eyes. Preventral area rounded, with small rather irregularly placed scales; postventral area narrowly rounded. Predorsal area, narrow, with a linear median naked area.

Occipital process equal to one fourth of the distance from its base to the dorsal, bordered by 4 scales on its sides; skull smooth in cross-section, very

<sup>1</sup> In those examined, one with 26, ten with 28, five with 29, three with 30.

<sup>2</sup> In those examined one with 43, four with 44, two with 45, four with 46, four with 47, one with 51.

convex. Interorbital much broader than the eye in adult. Frontal fontanel a little narrower than the parietal. Margin of second suborbital very convex; leaving a naked area, which is widest below. Maxillary equal to the eye; four or five teeth in the front row of the premaxillary, the third withdrawn from the line of the rest; five graduated teeth in the second row, their denticles in shallow crescents, maxillary with 2 or 3 minute teeth. Dentary with four large teeth abruptly followed by smaller ones on the sides.

Gill-rakers  $8 + 11$ .

Scales of the sides regularly imbricate, a few interpolated scales over the anal muscles.

Anal sheath of a single row of scales along the base of the anterior rays; caudal naked; a well-developed axillary scale. Lateral line but little deurved. Each scale of the sides with a few nearly parallel striae.

Dorsal but little farther from snout than the ventral, nearer snout than caudal, its margin rounded, the highest ray about 3.75 in the length, the penultimate a little less than half as long as the highest. Anal emarginate, the 2nd and 10th reaching the base of the 18th when depressed; first anal ray below or behind the base of the last dorsal ray. Ventrals not reaching anal, pectorals to ventrals.

Highly iridescent, blue above, greenish to silvery below; a club-shaped horizontal humeral spot, its pointed anterior end from the upper margin of the first scale of the lateral line along the row of scales above the lateral line to above the 5th scale of the line; a dark vertical bar crossing the opercle, followed by a light bar, a second dark bar across the posterior part of the humeral spot, a second light bar and then a third dark bar shading into the profusely dotted sides. Cheeks profusely dotted; a dark median line, most prominent in young specimens preserved in formalin; this line not extending along the sides of the caudal peduncle; a black spot at the base of the caudal, its margins shading into the dusky caudal but not definitely continued to the end of the middle rays. These markings fading with age. In life all fins but pectorals tinged with orange or brick-red.

### 13. *ASTYANAX* (*POECILURICHTHYS*) *ANTERIOR* Eigenmann.

Plate 40, fig. 2.

*Astyanax anterior* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 95; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 132.

HABITAT.—Tabatinga.



*Specimens examined.*

Catalogue number		Number of specimens	Size in mm.	Locality	Collector
20768 part	Type <i>α</i>	1	91 {	Tabatinga	Bourget
	Paratype	1	70 {		

Allied to *A. asymmetricus*, distinguishable from all other species by the anterior position and sublinear character of its humeral spot.

Head 3.5; depth 2.8; D. 11; A. 28-32; scales 9.5 or 10-52 or 53-6; eye 3+; interorbital 3.

Compressed; elliptical to the caudal peduncle; profile slightly depressed over the eye. Preventral area rounded, without a median series of scales; post-ventral area compressed to a narrow edge. Predorsal area compressed to a keel, the median line naked in front, some of the scales with the edge turned over the ridge near the dorsal, no median series of scales.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 4 or 5 scales on the sides. Anterior fontanel but little shorter than the posterior, exclusive of the groove on the occipital process. Interorbital scarcely convex. Second suborbital leaving a considerable naked area which is widest below. Four to six teeth in the front row of the premaxillary, the third tooth, or if there are six teeth, the fourth out of line; five teeth in the second row, their denticles in a slightly curved line. Maxillary with one or two minute teeth. Mandible with four large teeth and numerous smaller ones.

Gill-rakers 8 + 14, about half the length of the orbit.

Scales regularly imbricate, the rows not deflected over the anal, no auxiliary rows; each scale with several subparallel lines; scales largest above the pectorals where the height of their exposed edge is nearly twice its length. Caudal naked, anal sheath of a single series of caducous scales. Lateral line but little decurved, the row of scales below it parallel with it; axillary scale well developed.

Dorsal pointed, its origin equidistant from tip of snout and caudal, its height 3.6-4 in the length. Caudal lobes 3.5 in the length. Origin of anal and first scale behind dorsal equidistant from tip of snout. Anal emarginate. Ventrals and the second scale in front of the dorsal equidistant from tip of snout, their tips just reaching anal. Tips of pectorals beyond origin of ventrals but not to end of axillary scale.

A silvery lateral band about one third as wide as eye; a horizontal black spot one fourth as wide as eye and rather longer than eye, beginning on the upper part of the first scale of the lateral line and extending straight back, pointed behind; middle caudal rays black; otherwise plain.

## 14. ASTYANAX (POECILURICHTHYS) ABRAMIS (Jenyns).

## Plate 42, fig. 2.

*Tetragonopterus abramis* JENYNS, Zool. Beagle. Fishes, 1842, p. 123, pl. 23, fig. 1 (Rio Paraná); GÜNTHER, Ann. mag. nat. hist., 1880, ser. 5, 6, p. 12 (La Plata); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 274; BOULENGER, Trans. Zool. soc. Lond., 1896, 14, p. 35 (Descalvados); PERUGIA, Ann. Mus. civ. stor. nat. Genova, 1891, ser. 2a, 10, p. 25 (Rio Madidi); EIGENMANN & KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 521 (Asuncion; Arroyo Trementina).

*Astyanax abramis* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 439 (Peruvian Amazon); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 28 (Paraguay); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

*Tetragonopterus orbignianus* CUVIER & VALENCIENNES, Hist. nat. poissons, 1818, 22, p. 147, in part (Buenos Aires).

HABITAT.—Buenos Aires to Paraguay, Upper Amazon; base of Andes east of Bogota.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20768	19	64–104	Tabatinga, Amazon	Bourget
20773	9	55–90		
10000 I.	1	69 <sup>1</sup>	Asuncion, Paraguay	Anisits
9999 I.	1	51 <sup>2</sup>	Arroyo Trementina, Paraguay	Anisits
11082 I.	1	84	Rio Coxipo, Matto Grosso	Anisits
13629 I.	2	109–139	Quebrada Cramalote, Villavicencio	Gonzales
13630 I., 7321 C.	6	56–132	Barrigon, Rio Meta	Gonzales

One of the types of *Tetragonopterus orbignianus* Cuv. & Val. belongs to this variety.

This species is a modification of *A. bimaculatus*, from which it differs in the number of scales.

The following description is based on the specimens from the Amazon and the Paraguay.

Head 3.7 (4.2–4.4 in the specimens from Colombia), depth 2.5; D. 11; A. 30–34<sup>3</sup>; scales 7 to 10–38 to 49–6 or 7<sup>4</sup>; eye 3 in head; interorbital 2.7.

Silvery band well developed, a well-marked caudal spot, abruptly narrowed

<sup>1</sup> To base of caudal.

<sup>2</sup> 41 mm. to base of caudal.

<sup>3</sup> Of 30 examined five have 30 rays, five 31, eleven 32, five 33 and four 34. Of the specimens from Colombia one has 28, four 29 and three 30.

<sup>4</sup> Seven specimens from Tabatinga have 7–38–6; 7–39–6; 8–38–6; 7–41–6; 8–45–7; 7–48–6; 9–49–7; the three Paraguay Basin specimens have 10–16–7; 9–41–7; and 9–45–7. The specimens from Colombia have 9 or 10 —  $\frac{47}{1}$ ,  $\frac{48}{3}$ ,  $\frac{49}{2}$ ,  $\frac{50}{1}$ ,  $\frac{51}{1}$ , — 7 to 9.

on the caudal and continued to the end of about four rays, tapering forward traceable in favorable cases to below the dorsal as a dark streak in the middle of the lateral band; a dusky streak extending up and down from the humeral spot and another one parallel with it about three scales behind the humeral spot; the latter markings prominent in formalin specimens.

These specimens while quite different from some of the specimens of *A. bimaculatus* are similar to other specimens. They can be distinguished certainly only by the increased number of scales and even in this character they overlap typical specimens of *A. bimaculatus*.

# 15. ASTYANAX (POECILURICHTHYS) BIMACULATUS (Linné).

Plate 62, figs. 1, 2, 4, and 6; Plate 95, fig. 6.

*Charax* no. 54, GRONOVIVS, Mus. ichthyol., 1754, 1, p. 19, tab. 1, fig. 5.

*Albula maculata* LINNÉ, Museum Adolphi Frideric, 1754, p. 78, tab. 32, fig. 2.

*Tetragonopterus maculatus* MÜLLER & TROSCHEL, Horae ichthyologicae, 1845, 1, p. 14, tab. 3, fig. 4; Fische Britisch Guiana, 1848, p. 634 (Rupununi; Essequibo); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 321 (Demerara; River Capin; Pernambuco); STEINDACHNER, Süßw. südöstl. Bras., 1876, 3, p. 568, pl. 1, fig. 2 (Rio Parahyba; Rio Doce; Rio Mucuri); PETERS, Monatsb. Akad. wiss. Berlin, 1877, p. 472 (Calabozo); BOULENGER, Ann. mag. nat. hist., 1887, ser. 5, 19, p. 173 (Rio Grande do Sul); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 275; Perugia, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2a, 10, p. 13 (Rio Paraguay; Asuncion and Villa Maria); BOULENGER, Boll. Mus. univ. Torino, 1895, 10, p. 3 (Colonia Risso); PELLEGRIN, Bull. Mus. hist. nat., 1899, 5, p. 157 (Apuré); REGAN, Proc. Zool. soc. Lond., 1906, p. 384 (Trinidad).

*Salmo bimaculatus* LINNÉ, Syst. nat., 1758, ed. 10, 1, p. 311; 1766, ed. 12, p. 513 (South America); Bloch, Ausländische fische, 1791, 8, p. 110, taf. 382, fig. 2; Bloch, Systema ichthyologicae, ed. Schneider, 1801, p. 413.

*Charax bimaculatus* GRONOW, Syst. ichthyol., ed. Gray, 1851, p. 154.

*Astyanax bimaculatus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 432 (Peruvian Amazon; Headwaters of the Tocantins); EIGENMANN and OGLE, Proc. U. S. N. M., 1907, 33, p. 27, in part (Para; British Guiana); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432; Mem. Carnegie mus., 1912, 5, p. 359.

*Tetragonopterus linnaci* CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, 22, p. 142 (Cayenne).

*Tetragonopterus gronovii* CUV. & VAL., Loc. cit., p. 143 (Surinam); KNER & STEINDACHNER, Abhandl. Bayer. akad. wiss., 1864, 10, p. 46 (Rio Bayamo).

*Tetragonopterus orbignianus* CUV. & VAL., Loc. cit., p. 147 in part (Buenos Aires).

*Poecilurichthys brevoortii* GILL, Ann. Lyc. nat. hist. N. Y., 1858, 6, p. 57 (Trinidad); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 317.

*Tetragonopterus bartletti* GÜNTHER, Ann. mag. nat. hist., 1865, ser. 3, 18, p. 30 (Upper Amazon); COPE, Proc. Acad. nat. sci. Phil., 1871, p. 260 (Ambyiaeu).

*Astyanax bartletti* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 434, fig. 31 (Ambyiaeu).

*Tetragonopterus orientalis* COPE, Proc. Amer. philos. soc., 1870, 11, p. 559 (Para); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 279.

*Astyanax orientalis* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 434, fig. 35.

*Astyanax microstoma* HENSEL (non Günther) Wieg. archiv., 1870, p. 83.

*Tetragonopterus caudimaculatus* COPE, Proc. Amer. philos. soc., 1891, 33, p. 107 (Headwaters of Tocantins).

*Tetragonopterus jacuhiensis* COPE, Proc. Amer. philos. soc., 1891, 33, p. 88 (Rio Grande do Sul); ULREY, Ann. N. Y. acad. sci., 8, 1895, p. 280; FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 435 (Jacuhy).

*Tetragonopterus lacustris* BOULENGER (*non* Lütken), Trans. Zool. soc. Lond., 1896, **14**, p. 35 (Descalvados and North Paraguay); EIGENMANN & NORRIS, Revista Mus. Paulista, 1900, **4**, p. 357 (Piracicaba).  
*Astyanax lacustris* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 433 (Para; Peruvian Amazon).

*Tetragonopterus maculatus lacustris* EIGENMANN, Ann. N. Y. acad. sci., 1894, **7**, p. 633 (Rio Grande do Sul); ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 275; EIGENMANN & KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 521 (Asuncion; Estancia la Armonia; Arroyo Trementina).

*Astyanax rupununi* FOWLER, Proc. Acad. nat. sci. Phil., 1914, p. 243, fig. 6 (Rupununi).

HABITAT.—Eastern slope from about 3000 feet to the ocean, Buenos Aires to the Orinoco Basin, Magdalena.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1354 C.	1	102	Maripicru, branch of the Ireng.	Grant
1355 C., 11847 I.	5	87-133	Holmia	Eigenmann
1356 C., 11848 I.	102	37-142	Georgetown Trenches	Eigenmann
1357 C., 11848 I.	122	51-126	Botanic Garden, Georgetown	Shideler
1358 C., 11850 I.	7	74-85	Lama Stop-Off	Eigenmann
1359 C.	1	79	Madoonie Creek	Eigenmann
1360 C., 11851 I.	2	85 & 84	Mora Passage	Shideler
855	2 <sup>1</sup>	26 & 56	Surinam	Wyman
11308 I.	2	137 & 140	Trinidad	Guppy
26093	1	127	Trinidad	Garman
21024, 21025	4	76-142	Para, Marajo	Magalhaes
824	2	55-62	Para	Coske
21021, 21022, 21023	59 <sup>2</sup>	68-115	Para	Agassiz & Bourget
21075	1 poor	67	São Pedro	Thayer Exped.
21063, 21064	3	72-90	Arary	Thayer Exped.
21077	5	72-85	Porto do Moz	Vinhas
20848	1	60	Obidos	Bentos
1200	3	48-110	Pernambuco	Fletcher
21020	21	72-124	Pernambuco	Agassiz & Bourget
20697	1	about 100	Brazil	Senden
20900	3	118-about 145	Itabapuna	Hartt & Copeland
21050	2	54-59	Piabana	Thayer Exped.
20915	2	68-74	Rio Arassuahy	Hartt & Copeland
21082	11	about 70-82 (poor)	St. Anna de Ferres, Rio San Antonio	Thayer Exped.
20902, 20904	3	68-80	Rio Jequitinhonha	Hartt & Copeland
20918	7	63-75	Santa Clara, Rio Mucuri	Hartt & Copeland
20910	46	about 65-130	Rio Doce between Linhares and Porto de Souza	Hartt & Copeland
20917	31	87-134	Minas Geraes	Hartt & Copeland

<sup>1</sup> This specimen has but 27 anal rays and scales 7-37-6.

<sup>2</sup> Very variable, one 89 mm., has nearly all the characters assigned by Cope to his *orientalis* including depth 2; head 4; others of the same length have depth 2.3.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20684, <sup>1</sup> 20928, 20932	44	69-160	Rio Parahyba	Thayer Exped.
20935, 20940-20942				
20946	1	63	Juiz de Fora	Thayer Exped.
20882, 20884	3	97-101	São Matheos	Hartt & Copeland
20892, 20894-20897	18	48-113	Muriahe	Hartt & Copeland
20887, 20889	7	70-120	Mendez	Hartt & Copeland
20876, 20877	12	7-145	Campos	Hartt & Copeland
20685	4	107-128	Rio de Janeiro, Rio Parahyba	Agassiz & Bourget
21058, 21060	7	42-120	Rio de Janeiro	Thayer Exped.
9266 I.		43-about 104	Piracicaba	von Ihering
11635 I.	7	84-134	Piracicaba	von Ihering
4888 I.	1	about 110	Rio Grande do Sul	von Ihering
20695 part	1	about 107	Rio Grande do Sul	Dom Pedro II
	1	126	Rosario, La Plata	Capt. S. G. Brooks
837	1	93	Buenos Aires	Capt. S. G. Brooks
846	3	about 68-85	Uruguay River	Wyman
4308 I.	1	78	Para	Hartt
5171 I.	2	48-62	Lower Amazon	Hartt
5178 I.	3	40-about 52	Ditches of Para	Hartt
12815 I., 5009 C.	90 <sup>2</sup>	largest 117	Perené	Lola Vance

The following specimens in the Carnegie Museum were collected by Mr. J. Haseman.

Catalogue number	Number of specimens	Size in mm.	Locality
3236 C.	16 <sup>3</sup>	43-88	Pirapora, upper San Francisco
3237 C.	3	44-50	Lagoa Pereira
3238 C.	1 <sup>4</sup>		Lagoa da Porto
3239 C.	4	53-61	Lagoa da Porto
3240 C.	24	28-85	Barreiras
3241 C.	12 <sup>5</sup>	22-54 (about)	Lagoa of Rio Grande, Boqueirão, near mouth of Rio Preto
3242 C.	30	about 35-80	Santa Rita
3243 C.	4	30-73	Penedo
3245 C.	2	61-65 <sup>6</sup>	No label
3246 C.	11	48-86	Sete Lagoas
3247 C.		34-88	Rio das Velhas
— C.	6	37-47	Lagoa de Parnagua of the Parana-hyba Basin

<sup>1</sup> In one the humeral spot is exceedingly pale.

<sup>2</sup> Scales in five specimens 35, 35, 36, 36, 36; anal rays in five specimens 26, 26, 26, 27, 28. Humeral spot large.

<sup>3</sup> Depth  $2\frac{1}{3}$ -3. A. 25, 27, 26. Scales 32, 34-36.

<sup>4</sup> Depth 2.75, D. 27; Scales 43, lateral line broken on caudal peduncle.

<sup>5</sup> These specimens show how a lateral spot arises from a vertical band.

<sup>6</sup> To base of caudal.

Catalogue number	Number of specimens	Size in mm.	Locality
3253 C.	4 <sup>1</sup>	64-79	Entre Rios
3254 C.	33	54-109	Campos, June 13-14, 1908
3255 C.	4	76-86	Muniz Freire
3256 C.	12	48-68	São João da Barra
3257 C.	9	57-77	Lagoa Feia, Tocas
3258 C.	2	87	Barra da Pirahy
3259 C.	3	70-78	Jacarehy
3260 C.	23	37-56	São João del Rei
3262 C.	1	84	Rio Paranahyba Bridge, Goyaz
3261 C.	4	98-115	São João del Rei
3263 C.	17	60-118	Jaguara
3264 C.	17	37-58	Mogy Guassu
3265 C.	4	46-61	Bebedouro
3266 C.	3	78-145	Piracicaba
3267 C.	33	36-76	Salto Avanhandava
3268 C.	2	60-68	Itapura
3269 C.	9	55-61	Miguel Calmon, a lake four miles from town
3270 C.	2	109	Xiririca, Rio Iguapé
3271 C.	2	41-46	Porto Alegre, a creek west of Rio Grande do Sul
3272 C.	2	41-46	Cacequy
3273 C.	10	25-102	Uruguay and Frugnay Basin
3274 C.	31 <sup>2</sup>	33-57	Porto Alegre
3275 C.	2	59-92	San Joaquín
3276 C.	8	53-79	Barragança
3277 C.	1	42	Para
13626 L.	1		Barrigon, Rio Meta
13760 L.	60	largest 95 mm.	Santa Anna, Rio Urubamba, 3,400 ft.

Gonzales Coll.

E. Heller Coll.

Head 3.5-4.3; depth 2-2.6; D. 11; A. 21-43<sup>3</sup>; scales 6 to 8-31 to 41<sup>4</sup>-5 to 7; eye about 3, interorbital 2.3-2.4 in the head.

More or less regularly elliptical, varying from regularly elliptical to sub-rhomboidal; compressed but not excessively so. Preventral area rounded, without a median series of scales. Predorsal area narrowly rounded, a little broader than the postventral area; a few median scales near the dorsal, then

<sup>1</sup> A. 31; scales 8-38-7 (to ventrals).

<sup>2</sup> The specimens furnish an interesting variant. The lateral line is 35 in three, 36 in two, 37 in three, and 38 in one. The anal is 25 in one, 26 in two, 27 in four, 28 in one and 43 in one. The 43 rays occupy the same space occupied by the 27 in the others. The scales over the muscles of the anterior part of the fin are also much smaller and more numerous. The last ten rays occupy as much space as the last nine rays in normal specimens and over these the scales are normal.

<sup>3</sup> See p. 255 for details.

<sup>4</sup> See p. 255 for details.

a few scales with their margins bent over the back, then the median line naked.

Occipital process between one third and one fourth of the distance from its base to the dorsal, bordered by 4 scales on each side. Interorbital area broad, convex. Parietal fontanel about twice as long as frontal, exclusive of the groove on the occipital process. Second suborbital leaving a narrow naked area around the entire free border; a distinct notch between the preorbital and the first suborbital. Maxillary very oblique, 3.5-3.75 in the head, a little longer than the snout. Usually four (3-5) teeth in the front row of the premaxillary forming a compact series, of which the third may be somewhat withdrawn from the straight line; five teeth in the second row, the denticles of the larger ones arranged in a series ranging from a crescent to a U. Maxillary without teeth or with one small one. Four large teeth on the dentary and numerous small ones on the side.

Gill-rakers about  $10 + 15$ ,  $\frac{2}{3} - \frac{1}{2}$  the length of the eye.

Scales cycloid, with a variable number of divergent striae, regularly imbricate except on the predorsal and preventral area and sometimes over the anal musculature, the regular imbrication of one side joined to that of the other irregularly in the preventral area; near the dorsal the uppermost row of scales of the sides separated from that of the other side by a series of median scales, but further forward, usually meeting irregularly and directly along the middle line without median scales. Sometimes the median series of scales extends forward to within a few scales of the occipital process; over the anal muscles there are interpolated scales varying in number in different specimens. Anal sheath consisting of two rows of scales which are free from the rays. Caudal lobes without attached scales but with a basal sheath of large scales; axillary scale well developed.

Origin of dorsal a little nearer tip of snout than base of caudal, its penultimate ray  $2\frac{1}{2}$  in its longest ray, which is about one fourth of the length. Anal slightly emarginate in the young, straight in the adult, the longest rays in the largest specimens equal snout and eye in length, the shortest equal to snout and eye to pupil. Origin of ventrals and fourth scale in front of the dorsal equidistant from tip of snout; origin of ventrals equidistant from tip of snout and origin of caudal in the extreme young, and last fourth of anal in the oldest. Ventrals reaching anal in the youngest, falling considerably short in the oldest. Pectorals reaching slightly beyond origin of ventrals.

A well-defined, horizontally elongate, black humeral spot on the third to the sixth, or second to the fifth, scale in the series above the lateral line and on

the series above this, surrounded by a pale area; a spot on the caudal peduncle, fading out forward and continued behind to the tip of the middle caudal rays; caudal markings varying greatly in intensity. Sides silvery or brassy; sometimes a dusky cross-shade behind the pale area surrounding the humeral spot.

Vertebrae 13 + 19.

Air-bladders very large, the posterior one regularly curved, ending conically near the origin of the anal, twice as long as the anterior,  $2\frac{1}{2}$  times as long as wide, its width  $2\frac{1}{2}$  in the head.

Alimentary canal about equal to the total length.

This species varies very much in shape with the sex and with the character of its individual habitat. It also varies much in more constant characters, *i. e.* such as are not dependent on age, sex, or nutriment, with the geographical distribution. The specimens from the Rio San Francisco and Bahia seem to occupy the center from which the characters of the specimens to the north as well as those to the south vary. These variations have for the most part received distinct names which may be retained as varietal designations. Still other deviations are so well separated that they are recognized as distinct species.

The following table (p. 255) indicates the total variation of the species and its immediate relatives in the number of anal rays and scales in the lateral line, as well as the range of variation in each locality.

16. *ASTYANAX (POECHILURICHTHYS) BIMACULATUS BOREALIS* Eigenmann.

*Tetragonopterus maculatus* STEINDACHNER, Denks. K. akad. Wien, 1878, **39**, p. 58 (Rio Magdalena); 1880, **42**, p. 73 (Rio Cauca near Caeres, Colombia).

*Astyanax bimaculatus borealis* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 96; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Magdalena Basin.

In nine specimens from the Cauca and Magdalena Steindachner found one with 32 anal rays, three with 38, and the rest with between 36–39. This would give the usual number to be 38 and the average 37. The nearest average number of anal rays in *A. bimaculatus* in any other locality is 32.2. This difference is worthy of nominal recognition. I have seen no specimens.

The species is evidently restricted locally.



Anal rays and scales of the lateral line in *Astyanax bimaculatus*, its varieties, and of *A. orthodus*.

	ANAL RAYS															LATERAL LINE									
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41				
Cauca ( <i>vide</i> Steindachner) <sup>1</sup> .....												1													
Atrato and Patia <sup>2</sup> .....									1	5	2	2	3	1											
Trinidad <sup>3</sup> .....									1		1		1												
Guiana.....								1	1	4	3	9	3	1											
Lower Amazon.....										4	12	6	5	6	3										
Goyaz <sup>4</sup> .....									1	7	9	7	1												
Itabapana.....												2	1												
Parahyba.....									3	4	15	15	6												
Mucuri.....									1	3	2	1													
Rio Doce.....								1	12	12	7	1													
Jequitinhonha.....					1	1																			
Rio Janeiro.....								2	2	1	2														
Upper Rio Grande Basin.....					3	8	7	10	6	3	2	1													
Pernambuco.....						1	4	4	5	3	1														
Paraguay <sup>1</sup> .....								2	1	4	32	18	5	3											
Irapuairú Basin <sup>6</sup> .....						3	5	5	5																
Bahia <sup>5</sup> .....							1	2	5	3															
San Francisco <sup>6</sup> .....						1	2	5	3																
Perené.....	1		3	6	6	12	17	3																	
Rio Sapon <sup>7</sup> .....				3	4	3																			
Porto Alegre <sup>8</sup> .....					1	2	4	1																	

<sup>1</sup> *horrellii*<sup>2</sup> *orthodus*.<sup>3</sup> *brevoortii*.<sup>4</sup> *paraguayensis*.<sup>5</sup> *vitatus*.<sup>6</sup> *lacustris*.<sup>7</sup> *novu*.<sup>8</sup> One from this locality has 43 rays.

17. *ASTYANAX* (*POECILURICHTHYS*) *BIMACULATUS* *PARAGUAYENSIS*, subsp. nov.

Plate 62, fig. 5. Plate 92, fig. 1.

*Astyanax bimaculatus lineatus* EIGENMANN & OGLE (*non* Perugia), Proc. U. S. N. M., 1907, **33**, p. 27 (Paraguay); EIGENMANN, Ann. Carnegie mus., 1907, **4**, p. 137 (Asuncion; Corumba; Bahia Negra; Puerto Max; Sapucay); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT.—Paraguay and Upper Tocantins.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10005-6 I.	4	about 68-—about 115	Asuncion	Anisits
10008 I.	15	27-85	Bahia Negra	Anisits
10241 I.	1	35	Bahia Negra	Anisits
10247 I.	1	75 <sup>1</sup>		
10244 I.	1	about 90	Corumba	Anisits
10293 I.	3	23-26 <sup>1</sup>	Puerto Max.	Anisits
10239 I.	12	26-55		
10243 I.	7	29-49		
11083 I.	1	59	Caiza, Bolivian Chaco	
10007 I.	17	about 35-74	Arroyo Trementina	Anisits
10009 I.				
10010 I.				
10242 I.				
10243 I.				
20691	79	about 37-116	Goyaz	Honorio
3280 C.	7	30-93	Asuncion	Haseman
3281 C.	11	64-130	Sapucay	Haseman
3282 C.	2	45	Villa Hays	Haseman
3283 C.	3 <sup>2</sup>	—63	Villa Hays	Haseman
3284 C.	2	48, 78	Urucum Mts., Corumba	Haseman
3285 C.	6	39-67	Caceres	Haseman
3286 C.	1	89	San Francisco	Haseman
3287 C.	2	45, 55	Rio Santa Rita	Haseman
3274 C.	4	40-136	Boa Ventura	Haseman

This variety is distinguished from typical *A. bimaculatus* by the rows of spots along the centers of the scales.

<sup>1</sup> To base of caudal.<sup>2</sup> The last three are nearly plain and have prominent lips.

18. *ASTYANAX (POECILURICHTHYS) BIMACULATUS VITTATUS* (Castelnau).*Tetragonopterus vittatus* CASTELNAU, Exped. Amer. Sud. Poissons, 1855, p. 66, pl. 33, fig. 3 (Bahia).*Tetragonopterus bahiensis* STEINDACHNER, Süßwf. südöstl. Bras., 1876, **3**, p. 13 (Bahia); EIGENMANN and EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 281; GILBERT, Proc. Wash. acad. sci., 1900, **2**, p. 162 (reef at Mamanguape).

HABITAT.—Bahia.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20942	12	55-95	Bahia	Thayer Exped.
3248 C.	1	40-54	Queimadas, Rio Itapicuru	Haseman
3249 C.	6 <sup>1</sup>	40-63		
3299 C.	7	45-96	Rio Coite	Haseman
3298 C.	2	38, 46	Rio Jacobina	Haseman
3301 C.	1	43	Rio Itapicuru <sup>2</sup>	Haseman
3244 C.	16	37-51	Cachoeira	Haseman
3250 C.	7	25-50	Alagoinhas, Rio Catu	Haseman

In a number of specimens examined the anal rays and the lateral line are:—

	ANAL RAYS					LATERAL LINE				
	25	26	27	28	29	32	33	34	35	36
Itapicuru Basin.....	3	5	5	5	....	3	7	9	2	
Cachoeira.....	....	2	5	2	1	....	3	4	4	1
Alagoinhas.....	1	1	1	....	....	1	....	2		

These specimens thus grade into those of the Rio San Francisco.

The only variety of this genus from Bahia that can possibly have been used by Castelnau for his figure of *A. vittatus* is the one that was later designated as *A. bahiensis* by Steindachner. It is most nearly related to, and only distinguishable in the aggregate from the *A. lacustris* of its neighboring stream, the San Francisco. The usual number of anal rays is 27; the usual number of scales 34.

<sup>1</sup> One small specimen has a stuttering lateral line.<sup>2</sup> Six miles north of Bom Fin at Fazenda Amarutu.

19. *ASTYANAX (POECHLURICHTHYS) BIMACULATUS LACUSTRIS* (Lütken).

Plate 62, fig. 3.

*Tetragonopterus lacustris* LÜTKEN, Overs. K. Dan. selsk. Forh., 1874, p. 131 (Lagoa Santa); LÜTKEN, Vidensk. selsk., 1875, **12**, p. 208, pl. 5, fig. 15 (Rio das Velhas); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT.—Rio San Francisco.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20923	3	74-92 {	Rio San Francisco, below	Hartt
20925	1	64 <sup>1</sup> {	the Falls	
21035	6	112-134	Lagoa Santa	Allen & St. John
21041	2	51-53 {	Rio San Francisco	
21042	6			
21045	23		Lagoa Santa	
21043	39			
20875	34 <sup>2</sup>	about 34-132	Lagoa Santa	Seeva
21028, 21029	11	82-125	Bon Jardin, Rio San Francisco	Allen & St. John
3300 C.	6	55-75	Lagoa Salgado, Salitre Basin	Haseman
3302 C.	4	49-58	São Thomé, Salitre Basin	Haseman

The usual number of anal rays for this variety is 27, the average 26, the scales of the lateral line are usually 33-35.

The depth of the largest specimens in 20875 varies from 1.9-2.2 in the length; the anal rays vary from 23-27; the scales from 33-35.

20. *ASTYANAX (POECILURICHTHYS) BIMACULATUS NOVAE* Eigenmann.

Plate 52, fig. 3.

*Astyanax bimaculatus novae* EIGENMANN, Ann. Carnegie mus., 1911, **8**, p. 175, pl. 7, fig. 2.

HABITAT.—Eastern tributary of Rio Tocantins.

<sup>1</sup> To base of caudal.

<sup>2</sup> These are marked Brazil (Seeva). Inasmuch as their rays and fins correspond with Rio San Francisco specimens and with none others, and Seeva collected at Lagoa Santa, there can be little doubt as to the locality.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3278 C. Cotypes	13 <sup>1</sup>	40-63	Rio Sapon, Prazer, Bahia	Haseman
3279 C.	13	35-85	Above Cachoeira da Velha, de Rio Nova, Goyaz, Piaiana	Haseman

These specimens agreeing with the Rio San Francisco specimens in the anal rays and number of fin rays differ in having a black lateral stripe replacing the silvery band. The dark in the axils of the scales is also more conspicuous.

21. *ASTYANAX (POECHLURICHTHYS) JANEIROENSIS* Eigenmann.

Plate 42, fig. 1.

*Astyanax janeiroensis* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 96; Rept. Princeton univ. expd. Patagonia, 1910, 3, p. 433.

One specimen. 21057 Type. 92 mm. Rio de Janeiro. Thayer Expedition.

This species is closely related to *A. bimaculatus*. It differs conspicuously from typical specimens of *A. bimaculatus* from Rio de Janeiro in its much more elongate form.

Head 4; depth  $2\frac{5}{6}$ ; D. 11; A. 26; scales 6-38-5; eye 3.5; interorbital  $2\frac{3}{5}$ ; two maxillary teeth; denticles of the second series of premaxillary teeth in a crescent.

Pectorals not quite reaching ventrals, base of anal equals the space between the dorsals.

Width of body  $2\frac{1}{11}$  in the depth (3-3.4 in all specimens of *A. bimaculatus* from Rio de Janeiro); predorsal line entirely scaled, with an almost complete series of median scales.

A faint basal caudal spot not continued on the middle rays in the type which is very much bleached.

The following specimens<sup>2</sup> differ from the type of *A. janeiroensis* in having

<sup>1</sup> A. 24 in 3, 25 in 4, 26 in 3; L. 4. 32 in one, 33 in 2, 34 in 3, 35 in 4.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3288	8	83-119	Iguape	Haseman
3289	6	39-110	Agua Quente	Haseman
3290	2	71-105	Iporanga	Haseman
3291	1	106	Morretes, Paraná	Haseman

one or two additional rows of scales between the lateral line and the dorsal and usually one more than the type from the lateral line to the ventrals. The anal varies from 22–25. The color-differences of course count for little because the type is extremely faded. The humeral spot is very large and heavy; the caudal spot is continued forward as a dark band and to the tips of the middle caudal rays. The lateral line in one case lacks five pores of being complete. The species is evidently closely related to *A. wappi*.

22. *ASTYANAX* (POECILURICHTHYS) *GOYACENSIS* Eigenmann.

*Astyanax goyacensis* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 96.

One specimen. 20692 part Type. 76 mm., to base of caudal. Goyaz. Honorio.

This specimen differs in shape from all specimens of *A. bimaculatus* from Goyaz, so that it could not be confounded with them. It is much more elongate and heavier in front.

Denticles of the teeth of the second row of the premaxillary in a deep crescent.

Head 4; depth  $2\frac{5}{7}$ ; D. 11; A. 25; scales 7–38–5; eye 3.4; interorbital 2.25; width of body  $2\frac{7}{11}$  in its depth (over 3 in *A. bimaculatus*); pectorals not reaching ventrals; no interpolated rows of scales over anal; jaws equal (the teeth of the outer row of the premaxillary exposed when the mouth is closed in *A. bimaculatus*) second suborbital covering the entire cheek (leaving a naked margin in *A. bimaculatus*); one maxillary tooth; scales above the anal with four or more striae.

The narrow caudal spot continued to the end of the middle rays.

23. *ASTYANAX* (POECILURICHTHYS) *ORTHODUS* Eigenmann.

Plate 42, fig. 3.

*Astyanax orthodus* EIGENMANN, Proc. U. S. N. M., 1907, **33**, p. 27 (Truando); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT.—Western Colombia in both Pacific and Atlantic drainage.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
55655 U.S.N.M. Type	1	92 <sup>1</sup>	Truando, Colombia	Michler & Schott
5393 C., 13086 I.	∞	132 <sup>2</sup>	Truando	Wilson
5421 C., 13108 I.	6	68-132 <sup>1</sup>	Creek Altacar, Barbacoas	Henn & Wilson
4918 C., 12758 I.	2	85, 100	Quibdo	Eigenmann

This species is identical with *Astyanax bimaculatus* in apparently all characters except the teeth. In *A. bimaculatus* the teeth of the inner series of the premaxillary are convex behind; the denticles correspond to this convexity and are, therefore, arranged in a curve. This curve varies from a crescent to U-shape in a specimen from Piracicaba. In *A. orthodus* the anterior and posterior surfaces of the teeth are similar, the denticles being arranged in nearly a straight line. These species differ, therefore, as *Micralestes* differs from *Myletes*.

Head 4; depth  $2\frac{2}{5}$ ; D. 11; A. 31-34 in Truando,<sup>3</sup> usually 30 in Patia Basin;<sup>4</sup> scales 7 or 8-37 to 41<sup>5</sup>-6 above ventrals, 8 above origin of anal; eye 3-3.3 in the head; interorbital  $2\frac{1}{2}$ .

Dorsal and ventral profiles equally curved, the ventral curve continuous, the dorsal profile very slightly concave over the eyes; maxillary distinctly longer than in a specimen of *A. bimaculatus* of the same size, longer than eye, a little less than 3 in the head; maxillary with one to four teeth. Width of cheeks equal to diameter of eye in the adult; limbs of preopercle forming about a right angle.

In the position of the dorsal, equidistant from tip of snout and base of upper caudal rays, and the position of the ventrals the specimens agree exactly with one of *A. bimaculatus* of equal size from Rio Grande do Sul. Pectorals reaching to ventrals or a little further; ventrals to or near to anal; anal basis convex; margin of anal nearly straight; adipose well developed. Predorsal line more fully scaled than in *A. bimaculatus*, the young frequently with a series of scales; the median scales in the adult more or less deeply notched, and frequently with a narrow margin bent over the ridge of the scales of one side.

A longitudinal oval, humeral spot; caudal spot sometimes continued to end of middle rays, usually confined to the scaled area at their base, some-

<sup>1</sup> To origin of the caudal.

<sup>2</sup> Largest specimen.

<sup>3</sup>  $\frac{31}{2}$ ,  $\frac{32}{2}$ ,  $\frac{33}{3}$ ,  $\frac{34}{1}$

<sup>4</sup>  $\frac{24}{1}$ ,  $\frac{30}{3}$

<sup>5</sup>  $\frac{37}{1}$ ,  $\frac{38}{6}$ ,  $\frac{39}{2}$ ,  $\frac{40}{1}$ ,  $\frac{41}{2}$  in the Truando,  $\frac{36}{2}$ ,  $\frac{37}{3}$ ,  $\frac{38}{1}$  in Barbacoas.

times (Patia Basin) occupying nearly the entire width of the peduncle; young frequently with dark lines following alternate septa between myotomes near to middle line.

Humeral spot sometimes with a light border in front and behind, obscured by a vertical band in the young.

#### 24. *ASTYANAX* (*POECILURICHTHYS*) *POTAROENSIS* Eigenmann.

Plate 54, fig. 1.

*Astyanax potaroensis* EIGENMANN, ANN. Carnegie mus., 1909, 6, p. 22; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433; Mem. Carnegie mus., 1912, 5, p. 361, pl. 7, fig. 5.

HABITAT.—Potaro River. Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1037 C. Type	1	58	Amatuk Cataract, Potaro River	Eigenmann
1038 C., 11733 L.	12	51-64		
Paratypes				
1039 C.	1	about 59	Kangaruma, Lower Potaro River	Shideler
1040 C.	1	45	Tukeit, Lower Potaro River	Eigenmann
1041 C., 11734 L.	2	47, 49	Erukin, Lower Potaro River	Eigenmann

Evidently allied to *A. bimaculatus* and *A. orthodus*. It is readily distinguished from *A. bimaculatus* by its emarginate anal, the broad caudal band, and the absence of any stripe on the caudal peduncle. In the coloration of the sides it approaches *A. abramoides*, the humeral spot being less well defined, the black lateral line being absent. Its anal is distinctly shorter than that of *A. orthodus*.

Head 3.5; depth 2.6-3; D. 11; A. 27 or 28, rarely 29; scales 8 (rarely 9)-37 to 38<sup>1</sup>-6 or 7; eye 2.75; interorbital 3.

Elongate, subrhomboidal, profile rising rapidly in front, then curved more gently to the dorsal; ventral profile regularly rounded. Preventral area convex, without a distinct median series of scales; postventral area narrowly rounded. Predorsal area narrowly rounded, two scales in front of the dorsal, the median line otherwise naked to the occipital process.

<sup>1</sup> In ten specimens five have 37, three 38, one has 39 and one 41 scales.



Occipital process very narrow, its width not quite half its length which is about  $\frac{1}{5}$  as long as the distance from its base to the dorsal, bordered by three scales on the sides. Interorbital smooth and convex. Frontal fontanel a little narrower and a little shorter than the parietal. Second suborbital leaving a considerable naked area which is widest below. Mouth large. Maxillary a little longer than the eye. Normally four teeth in the outer series of the premaxillary of which the third is withdrawn from the line of the rest; five teeth in the second series. Maxillary with three small teeth. Mandible with four large teeth in the dentary and abruptly minute ones on the side.

Gill-rakers 6 + 14, those of the upper arch excessively minute, those of the lower arch about  $\frac{1}{3}$  the length of the eye.

Scales of the sides regularly imbricate, no interpolated scales over the anal; scales of the ventral surface less regularly imbricate.

Anal sheath composed of a single series of scales along the base of the anterior rays. Lateral line but little decurved.

Ventrals but little in advance of the vertical from the dorsal, which is a little nearer the snout than the caudal; highest dorsal ray about 4 in the length. Anal emarginate, the second and fourteenth rays reaching the base of the twentieth ray. Ventrals not reaching anal. Pectorals just to ventrals.

Coloration much as in *A. abramoides*, a dark bar crossing opercle, a second bar some distance behind this in a light area, the second bar widest above the lateral line where it forms an indistinct humeral spot; a third bar shading into the thickly dotted sides; cheeks thickly punctate, a dark dorsal streak. A black band crossing the base of the caudal and sometimes extending out along the outer rays. No dark line along the sides in formalin specimens, sometimes dark streaks up and down from the median line between segments of muscle.

## 25. ASTYANAX (ZYGOGASTER) STILBE (Cope).

Plate 43, fig. 3.

*Tetragonopterus stilbe* COPE, Proc. Amer. philos. soc., 1870, **11**, p. 559 (Para); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 275.  
*Astyanax stilbe* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 431, fig. 34 (Para); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 28 (Para); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT: Para and Atrato Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4919 C., 12757 I.	55		Boca de Certequi	Eigenmann
4920 C., 12756 I.	40	140 <sup>1</sup>	Quibdo	Eigenmann
5390 C., 13083 I.	6		Certequi	Wilson
5388 C., 13081 I.	1		Quibdo	Wilson
6695 C., 13581 I.	∞	100 <sup>1</sup>	Truando	Wilson
34589 U.	3	47, 56, 67 <sup>1</sup>	Para	J. C. Brevoort

*Astyanax stilbe*, *A. caucanus*, and *A. atratoensis* are certainly closely related if not synonymous.

The following description is based on three specimens 34589 U. S. N. M. from the type-locality. The two larger specimens are more elongate but otherwise very similar to the smaller. In the following description the statements in brackets refer to the smaller specimen only.

Head about 3.75 (3.6); depth 2.66 (2.4); D. 11; A. 40 (36); scales 8-40-7 (8-40-8 to ventrals); eye 2.6-2.66 in the head, 2 in the head less opercle, a little longer than interorbital.

Compressed, profiles symmetrically curved. Predorsal and preventral areas bluntly keeled, the mid-line of the former naked to near the dorsal, a few median scales near the dorsal, otherwise the scales of the two sides approaching and sometimes overlapping the middle line.

Occipital process about 3 in the distance to the dorsal. Fontanels large, the frontal about 1.33 in the parietal without the groove. Second suborbital leaving a distinct naked border which is a little narrower below. Maxillary-premaxillary border equals the eye. Four teeth in the outer series of the premaxillary, five in the inner. Maxillary with one tooth. Mandible with five graduated teeth, the last one quite small, and about 5 minute subconical teeth. Denticles of the second series of premaxillary teeth in a crescent.

Gill-rakers 10 + 17.

Origin of dorsal nearer snout than caudal; margin of dorsal obliquely truncate, its highest ray about equal to the length of the head. Origin of anal on or a little behind the vertical from the last dorsal ray. Ventrals reaching anal in the two larger. Pectorals reaching three or four scales beyond origin of ventrals.

Scales regularly imbricate except over the anal where the rows are deflected

<sup>1</sup> To base of caudal.

towards the anal; a few diverging radials. Lateral line decurved; a row of scales along the base of the anterior part of the anal.

A conspicuous round humeral spot over the third and fourth scales of the lateral line; a spot at the base of the caudal.

This species is abundant in the Atrato in which the following number of scales were observed in the lateral line:  $\frac{32}{2}$ ,  $\frac{19}{17}$ ,  $\frac{11}{13}$  and the following number of anal rays  $\frac{36}{15}$ ,  $\frac{37}{1}$ ,  $\frac{38}{6}$ ,  $\frac{39}{6}$ ,  $\frac{40}{7}$ .

The outer ventral rays in the male are sometimes filiform and the anal is sometimes distinctly falcate, the third and fourth rays forming a narrow lobe, the fifth to eighth rays decreasing rapidly in height.

This species is replaced by *A. caucanus* in the Magdalena Basin, which differs only in having the second suborbital in contact with the lower limb of the preopercle along the entire length.

## 26. ASTYANAX (ZYGOGASTER) MAGDALENÆ Eigenmann and Henn.

*Astyanax magdalene* EIGENMANN & HENN, Ann. Carnegie mus., 1914, 7, p. 89.

HABITAT.—Magdalena Basin near Girardot.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5822 C. Type	1	53	Girardot	Eigenmann
13611 I. Paratype	1	61	Apulo	Gonzales

Closely related to *A. stilbe* (Cope) differing in the greater depth, the shorter anal, and the lack of a median series of preventral scales.

Head 3.5–3.8; depth 2.33; D. 11; A. 33–34; scales 8–36 or 37–7 (to ventrals), snout 1.3 in eye, 4–4.5 in head; eye 3–3.3 in head and equal to interorbital.

Dorsal and ventral profiles equally and strongly arched. Predorsal area without a median series of scales, those of the two sides overlapping, an occasional median scale near the origin of the dorsal. Preventral area keeled, scales of the two sides apposed in the mid-line.

Interorbital convex, smooth; occipital process elongate, sharp, about one fourth of the distance from its base to the dorsal, bordered by three large scales. Frontal fontanel bluntly triangular, as wide as the parietal and about two thirds as long as the parietal without the occipital groove. Second and

third suborbitals leaving a narrow naked margin behind and below. Maxillary as long as the eye, shorter than the mandible, which is equal to the snout and half the length of the eye. Premaxillary with four broadly tricuspid teeth in the outer row and five brown-tipped 4- to 5-pointed teeth in the inner row. Maxillary with a single minute tooth in the upper angle. Mandible with five sharp 3- to 4-pointed teeth.

Origin of dorsal about equidistant from the snout and the base of the caudal, or slightly nearer the snout, its anterior rays 3.4 in the length. Caudal sharp, lobes equal and as long as the head. Anal not emarginate, short, its longest ray equalling length of ventrals or the head without snout and half the eye. Origin of anal slightly in advance of vertical from last dorsal ray.

Scales regularly imbricate below the lateral line from above the ventrals, posteriorly they are deflected or decurrent to the anal.

Anal sheath, a single row of oblong scales decreasing in size progressively towards the last rays; a short axillary scale. Lateral line gently decurved throughout its length.

Silvery; a lateral streak of bright silver from operculum to caudal; a single round black humeral spot; a horizontally oval spot at the end of the caudal peduncle.

## 27. *ASTYANAX (ZYGOGASTER) ATRATOENSIS* Eigenmann.

Plate 43, fig. 2.

*Astyanax atratoensis* EIGENMANN, Proc. U. S. N. M., 1907, **33**, p. 28, fig. 5 (Truando); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 133.

HABITAT.—Atrato Basin.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11488 I. Cotype	1	105	Truando, Colombia	Michler & Schott
5389 C., 13082 I.	∞	144 <sup>1</sup>	Truando, Colombia	Wilson
5391 C.	∞	145 <sup>1</sup>	Quibdo	Wilson
12756 I., 13084 I.	13	123	Quibdo	Eigenmann
12757 I., 13083 I.	13	115 <sup>1</sup>	Boca de Certequi	Eigenmann

Head 3.66–4; depth 1.9–2.25, on an average, 2.1; D. 11; A. 37–40,  $\frac{37}{4}$ ,  $\frac{38}{13}$ ,  $\frac{39}{3}$ ,  $\frac{40}{11}$ ,  $\frac{42}{11}$ ; scales 8 or 9 —  $\frac{36}{1}$ ,  $\frac{37}{2}$ ,  $\frac{38}{16}$ ,  $\frac{39}{1}$ ,  $\frac{40}{1}$ ,  $\frac{42}{1}$  — 8 or 9 (to ventrals); eye 2.8–3 in the head; interorbital 2.25–2.66 in the head.

Much compressed, subrhomboidal, the dorsal profile being equally arched with the ventral, the anal basis being nearly parallel with the predorsal profile; profile slightly concave over the eye, nape not sharply convex as in *Tetragonopterus*. Preventral very narrowly rounded, with a nearly complete median series of scales; postventral area still more compressed without a median series of scales. Predorsal area keeled, with but a few median scales near the dorsal, then with the margins of the scales bent over the back and then naked toward the occipital process.

Occipital process narrow, nearly  $\frac{1}{3}$  of the distance from its base to the dorsal, bordered by 3 or 4 scales. Interorbital smooth and distinctly convex. Frontal fontanel extending to over the anterior margin of the pupil, not much shorter than the parietal without the occipital groove. Second suborbital leaving but a very narrow naked area behind, in contact with the preopercle below, sometimes a naked angle below the suture between the first and second suborbitals. Mouth moderate. The slender maxillary not quite equal to the eye in length, not extending much, if any, beyond the origin of eye. Premaxillary with four, rarely five, teeth in the outer row and five in the inner; inner surface of the inner teeth convex, the points being arranged in a curved line, the middle point distinctly largest. Maxillary with one small tooth. Dentary with four large, graduate teeth followed on the sides by abruptly smaller teeth.

Scales cycloid, with numerous striae, those of the back and above the pectorals regularly imbricate, those below the lateral line and beyond the pectoral with interpolated rows; in the type the first interpolated row is under the 12th scale of the lateral line and begins in the sixth series below the line; the second begins directly under the 16th scale; another under the 4th scale below the 17th scale of the lateral line, another under the second scale below the 19th of the lateral line, immediately under the 21st scale and others under the fifth scale below the 22d and 23rd scales of the lateral line; another immediately under the 24th scale, another below the sixth scale under the 25th of the lateral line, two others below the 2d scale under the 26th and 27th scales respectively, and the last immediately under the 28th, which extends obliquely back, reaching the posterior margin of the anal fin; axillary scale well developed; anterior part of anal sheath not distinctly demarked from the scales of the sides, low, of about 3 series scales in front, of one series behind. Lateral line but little decurved.

Dorsal over the 11th scale of the lateral line, origin of ventrals under the 9th; dorsal sharply pointed, the second and third rays sometimes slightly pro-

duced, 3.4-4 in the length; caudal deeply forked; the lower lobe distinctly the longer; anal basis long, the fourth ray longest, forming with the third and fifth rays a very narrow, produced lobe in the male, with its origin under the last dorsal ray, slightly nearer base of pectorals than to the end of the anal. Ventrals nearly or quite reaching anal. Pectorals beyond origin of ventrals by 2 scales.

Iridescent; a well-marked vertically oval humeral spot, forming part of a humeral bar, a light bar in front of it and another behind it; a silvery lateral band, a small caudal spot, not continued to the end of the middle rays although the middle rays are darker than the rest.

This species is very abundant in the Truando. Of the numerous other localities examined in which large numbers of related species were taken only Quibdo yielded specimens of this species. It is possible that one of Steindachner's specimens recorded as *A. caucanus* belongs here.

Two readily distinguishable varieties were taken in the Truando. In one the color-markings are strong, the iris has a dark area below the pupil and a larger one above it. In the others there is no pigment below the pupil which is smaller, the color is less intense but the tip of the ventrals and marginal half of the anal is sometimes quite dark. It is possible that the difference in the color is due to the contracted color-cells in the latter, and the expanded condition in the former.

## 28. ASTYANAX (ZYGOGASTER) CAUCANUS (Steindachner).

### Plate 43, fig. 1.

*Tetragonopterus caucanus* STEINDACHNER, Ichthyol. beitr., 1878, 8, p. 71 (Cauca); Denks. K. akad. wiss. Wien, 1880, 42, p. 20, pl. 6, fig. 2 (Cauca); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 273.

*Astyanax caucanus* FOWLER, Proc. Acad. nat. sci. Phil. 1906, p. 343 (Paramaribo); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Lower Cauca and Magdalena Rivers, Colombia.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4926 C., 12761 I.	60	11-99	Soplaviento	Eigenmann
4927 C., 12762 I.	170	170 <sup>1</sup>	Calamar	Eigenmann
4924 C., 12759 I.	12	36-80	Calamar Cienega	Eigenmann

<sup>1</sup> Largest specimen.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4929 C., 12764 I.	5	49-70	Near Puerto Wilches	Eigenmann
4925 C., 12760 I.	16	53-88	Below Buena Vista	Eigenmann
4921 C., 12765 I.	30	87 <sup>1</sup>	Peñas Blancas	Eigenmann
12766 I.	7	97 <sup>1</sup>	Puerto del Rio	Eigenmann
12763 I.	1		Honda	Eigenmann
4922 C., 12767 I.		107 <sup>1</sup>	Girardot	Eigenmann

Very abundant in the Magdalena from the coast as far as Honda or Girardot at least. It was not taken in the upper (3000 feet) part of the Cauca.

There is very little difference between *A. atratoensis* and *A. caucanus*; the latter is a little more slender on an average, and the head is comparatively a little shorter. The two species can very readily be distinguished at sight. It is very probable that *A. caucanus* should be placed in the synonymy of *A. stilbe*; they differ in the development of the second suborbital.

Head 4-4.33; depth 2.33-3, average 2.7; D. 11; A.  $\frac{3.6}{4}$ ,  $\frac{3.7}{6}$ ,  $\frac{3.8}{10}$ ,  $\frac{3.9}{8}$ ,  $\frac{4.0}{3}$ ,  $\frac{4.1}{1}$ ; scales 7 or 8 -  $\frac{3.6}{1}$ ,  $\frac{3.7}{1}$ ,  $\frac{3.8}{17}$ ,  $\frac{3.9}{6}$ ,  $\frac{4.0}{5}$ ,  $\frac{4.1}{3}$ ,  $\frac{4.2}{1}$  - 7 or 8.

## 29. ASTYANAX (ZYGOGASTER) FILIFERUS (Eigenmann).

Plate 51, fig. 2.

*Zygogaster filiferus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 23 (Apulo).

HABITAT.—Central portion of Magdalena Basin.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
12847 I. Type	1	110	Apulo	Gonzales
12768 I., 4923 C.	125	140 <sup>1</sup>	Apulo	Gonzales

*Astyanax caucanus* seems to shade into this species at Apulo. All the specimens were preserved in formalin so a direct comparison with the alcoholic material from the Magdalena is not altogether satisfactory.

Males of *S. filiferus* are undoubtedly more slender than males of *A. caucanus*. The origin of the anal is nearer to the origin of the dorsal than to the base of the last anal ray. The depth in the males is 3 in the length, the depth in the females averages 2.5.

A. 38 or 39; scales in the lateral line 38 or 39.

The outer rays of the ventrals and the first dorsal ray are prolonged, filiform.

<sup>1</sup> Largest specimen.

So far as known, this character is found among other characins only in some specimens of *A. stilbe* from the Atrato and in some of the Cheirodontinae. The preventral surface in the male is very narrow, the scales of the two sides are straight edged below and joined by a series of narrow median scales.

Head 4.25; depth 3; D. 11; A. 38; scales 7-38-6; eye 1- in snout, 3+ in head; interorbital 2.9 in the head; depth of caudal peduncle equals its length or the length of the postorbital portion of the head.

Slender; ventral profile a nearly regular segment of a circle from the mandible to the end of the anal; dorsal profile a little less regular, less deeply arched. Preventral area narrow, rounded, with a narrow median series of scales; post-ventral area narrow. Predorsal area rounded, with about six median scales in front of the dorsal, and about six irregular scales farther forward.

Occipital process unusually long and slender, its length equal to nearly a third of the distance from its base to the dorsal. Interorbital very convex. Mouth terminal, snout pointed. Maxillary about .6 as long as eye; maxillary-premaxillary border equal to the eye in the length; greatest width of the second suborbital about two thirds of the length of the eye; five teeth in the front row of the premaxillary on one side, four on the other, five teeth in the inner series of the premaxillary. One tooth on the maxillary, four large teeth in the mandible in front, minute ones on the sides.

Scales regularly imbricate except over the anal muscles where they are much smaller and the rows are deflected toward the anal. Caudal naked, anal with a sheath of a single series of scales which are continuous with those above its base; axillary scale long; lowest row of scales of the sides with their ventral margin straight, those of the two sides nearly meeting in front of the ventrals; a narrow median series between them.

Origin of dorsal an orbital diameter nearer tip of snout than end of last scale of the lateral line, the second ray prolonged in a filament, 3.33 in the length. Caudal deeply forked, the lobes about 3.5 in the length. Anal low, but little emarginate, its origin equidistant from middle of eye and end of last scale of the lateral line, on the vertical from the last dorsal ray. Outer ventral ray prolonged, reaching to base of fifth anal ray. Pectorals reaching two scales beyond origin of ventrals.

Easily distinguished by the filiform dorsal and ventrals, the position of the dorsal; the five teeth in the inner series of the premaxillary and the peculiar scaling of the preventral and predorsal areas, as well as by the small scales covering the anal musculature.

The type is a male with retrorse hooks along the first ten anal rays.



*Key to the Species of the Subgenus Astyanax.*

- a. Scales 8 to 10-50 to 55-8 or 9; A. 22-25; frontal fontanel not much shorter than the parietal; one tooth on the maxillary. . . . . 30. *microlepis* Eigenmann.
- aa. Scales 8 or 9-43 to 45-7 or 8; A. 27; frontal fontanel 2.5 in the parietal; no maxillary teeth. . . . . 31. *cordovae* (Günther).
- aaa. Lateral line rarely with more than 39 scales, 41 in some specimens of *A. fasciatus*, *A. gymnogenys*, *A. taeniatus*, and *A. scabripinnis*.
- b. Dark stripes between the rows of scales on the sides; a dark band along caudal peduncle continued to the end of the middle rays; A. 26-28; scales 6 or 7-34 to 38-5; depth 2.8. . . . . 32. *lineatus* (Perugia).
- bb. No lateral stripes. Usually a silvery band.
- c. Second suborbital not covering entire cheek.
- d. Anal with 25 or more rays (*A. laticeps* 24-25; *A. eigenmanniorum* and *A. ruberrimus* 23-28; *A. fischeri* 23-29; *A. ribeirae* 23-27; *A. multidentis* 24-25).
- e. An elongate humeral spot.
- f. Depth 3 in the length; pectorals not reaching ventrals. Scales 7-34 to 38-6. Scales in 14 rows. Dorsal fin behind the base of the ventrals. Maxillary with one tooth, extending a little beyond the anterior border of the eye to end of first suborbital; interorbital space much greater than the eye, very convex; eye 4 in head; head  $3\frac{1}{2}$ ; depth 3; A. 27 or 28. A humeral spot twice as long as high. . . . . 33. *vappi* (Cuv. & Val.).
- ff. A conspicuous projectile-shaped humeral spot, the blunt end forward. Depth 2.3-2.6; scales 6-34 or 35-5; A. 25 or 26; eye 2.7 in the head; interorbital 3-3.5. . . . . 34. *micronatus* Eigenmann.
- ee. Humeral spot diffuse, (or absent), vertically elongate.
- g. Snout very blunt, rounded; maxillary more than 2 in the snout and eye.
- h. Snout half as long as the eye; 5 teeth in the front row of the premaxillary; depth 2.4; eye 2.4; A. 28; scales 6-35-4 . . . . . 35. *brevirhinus* Eigenmann.
- hh. Snout more than half the length of the eye; 2 or 3 teeth in the front series of the premaxillary; a caudal band; depth 2.5-2.6; eye 2.5; A. 23-24; scales 5-35-4. . . . . 36. *giton* Eigenmann.
- gg. Snout more or less pointed, the mouth terminal.
- i. No caudal spot; cheek narrowly naked.
- j. A. 31; depth 2.4; scales 8-35-7; maxillary with 1 tooth; a diffuse humeral band. . . . . 37. *daguae* Eigenmann.
- jj. A. 30; depth 2.8; maxillary without teeth, a rounded humeral spot. . . . . 38. *longior* (Cope).
- jjj. A. 27 or 28; depth 2.8-3.2; maxillary with one small tooth. . . . . 39. *marionae* Eigenmann.
- ii. Caudal spot rounded, not continued to the end of the middle rays.
- k. A. 23-28; eye 3 in the head, 1.2 in the interorbital; maxillary equals snout; depth 2.2-2.75; caudal spot conspicuous, across the entire caudal peduncle in the younger. . . . . 40. *ruberrimus*<sup>1</sup> Eigenmann.
- kkk. A. 23-27; eye 2.75-3, equal to the interorbital or greater; scales 6 or 7-31 to 38-5 or 6; caudal spot at least as large as eye; depth 2.5-3. . . . . 41. *ribeirae* Eigenmann.
- iii. A black caudal band extending to the end of the middle rays.
- l. Dorsal from nearly an orbital diameter to several nearer the snout than the base of the middle caudal rays.
- m. Four or five teeth in the inner series of the premaxillary; no humeral spot; a band from above the origin of the anal obliquely to the end of the middle caudal ray and the three rays above it; depth 2.5; eye 3.5-3.7; maxillary with one tooth, a little longer than eye; A. 25-30; scales 8 or 9-40 or 41, 6 or 7 . . . . . 42. *mutae* Eigenmann.

<sup>1</sup> Based on specimens from the Pacific slope of Colombia. Specimens from Panama have A. 23-29; eye 3-3.2, 1-1.25 in the interorbital; maxillary equals snout; caudal spot well defined, oval; scales 6 or 7-34 to 37-5 to 7; depth 2.66-3.

- mm.* Five teeth in the inner series of the premaxillary. No humeral spot; depth 2.5-2.75; eye 3.66-4 in the head; maxillary with 0-3 teeth, extending considerably beyond anterior margin of eye; a conspicuous black band on the caudal peduncle, becoming wedge shaped on the caudal. A. 29-31; scales 7 or 8-37 or 38-6.  
43. *maximus* (Steindachner)
- mmm.* Four teeth in the inner series of the premaxillary. A humeral spot. Postventral surface broadly rounded. (Central America).  
*n.* Depth 3.25; eye 3.25; interorbital 2.3; A. 27; scales 8-39-6.5; head broad, blunt, 5 in the length.....44. *regani* Meek.  
*nn.* Depth 2.6; eye 3+, interorbital 2.3; A. 26; scales 7-38-7.5.  
45. *albeolus* Eigenmann.
- ll.* Dorsal usually about equidistant from snout and caudal. Five teeth in the inner series of the premaxillary except sometimes in *A. rivularis*, *A. obscurus* and *A. acutus*.  
*o.* Two to seven multicuspoid teeth in a rather compact row at the anterior half of the maxillary.  
*p.* Interorbital 2.4-3 in the head.  
46. *nicaraguensis* Eigenmann & Ogle.  
*pp.* Interorbital 3.33-3.5 in the head; 14-17 gill-rakers on the lower arch.....47. *angustifrons* (Regan).  
*oo.* One or two, rarely three, maxillary teeth.  
*q.* Depth of caudal peduncle usually more than half the length of the head; usually a single tooth in the maxillary. Depth 2.3-3.  
*r.* Scales below the lateral line in series parallel with it.  
*s.* Caudal band simple, median. 48. *fasciatus* (Cuvier).  
*ss.* Caudal band median, a spur from its base extending downward .... 49. *fasciatus heterurus* Eigenmann.  
*rr.* The series of scales below the lateral line deflected toward the anal by the interpolation of supplementary series.  
50. *fasciatus parahybæ* Eigenmann.  
*qq.* Depth of caudal peduncle about half the length of the head; snout more or less pointed; maxillary 2 or less than 2 in the snout and eye; depth 2.75-3.33; eye 2.4-3 in the head, usually much greater than the interorbital; humeral spot not sharply defined.  
*t.* Occipital process more slender, maxillary a little longer, not so sharply contracted, with one or two narrower teeth.  
51. *fasciatus jacquithonhæ* (Steindachner).  
*tt.* Occipital process equal to the snout or shorter; maxillary shorter and broader, sharply contracted above, with a very broad tipped tooth, or two or three narrower ones...52. *fasciatus macrophthalmus* Regan.  
*qqq.* Depth of caudal peduncle usually less than half the length of the head; maxillary rarely with as many as three teeth; eye in adult 3 or more in the head, less than interorbital; humeral spot large and conspicuous; A. usually 25-29.  
53. *fasciatus acutus* (Günther).
- dd.* Anal with 17-24 rays (see also exceptions under *d.* p. 271).  
*u.* Caudal spot continued on middle caudal rays to their tip.  
*v.* Depth 2.3-2.7; five teeth in the inner series of the premaxillary; snout usually pointed.  
*w.* Dentary with abruptly smaller teeth on the sides; depth of caudal peduncle scarcely half of the length of the head; 12-15 scales in front of the dorsal; A. usually 22-24.  
54. *mexicanus* (Filippi).

- ww.* Dentary teeth more or less graduated on the sides; depth of caudal peduncle more than  $\frac{1}{2}$  head, about 10 to 13 scales in front of the dorsal.
- x.* Usually 3 teeth in the front row of the premaxillary; A. 19-24; two maxillary teeth; scales 5 to 7-32 to 39-4 or 5.
55. *taeniatus* Jenyns.
- [*xx.* Three or four teeth in the front row of the premaxillary; A. 21 or 22; one maxillary tooth; scales 6-41-6; second suborbital leaving a naked area but one third narrower than the bone.
- see *A. gymnogenys*, p. 274].
- xxx.* Usually 4 teeth in the front row of the premaxillary; A. 23-28; scales 33-36; one maxillary tooth.
56. *eigenmanniorum* (Cope).
- [*xxxx.* Two or three teeth in the front row of the premaxillary; A. 23-24; scales 35. Snout more than half the length of the eye.
- see *A. giloi*, p. 271].
- vv.* Depth 2.6-3.6.
- y.* Head 3.75-4.25; snout slightly shorter than eye; head heavy; body deepest and heaviest over middle of pectorals.
- z.* Usually three teeth in the outer row of the premaxillary. Anal 17-23.
57. *scabripinnis* (Jenyns).
- zz.* Usually four teeth in the outer row of the premaxillary; a round or oval humeral spot.
- A. A. 22-24; depth 2.75. Eye equals snout, 1.5 in the interorbital.
58. *scabripinnis laticeps* (Cope).
- AA. A. 17-23; one to seven teeth in the maxillary; depth 2.6-3.66.
59. *scabripinnis paranac* Eigenmann.
- zzz.* Four or five teeth in the inner as well as outer series of the premaxillary, very rarely 3 in the outer series. A. 20-25.
60. *scabripinnis rivularis* (Lütken).
- yy.* Head 3.25-3.6; eye 3.3, snout and interorbital 3-3.33 in the head, in the adult the snout and interorbital greater than the eye; maxillary in old reaching to below middle of eye.
61. *scabripinnis longirostris* (Steindachner).
- yyy.* Eye 3 or less than 3 in the head; body deepest at origin of dorsal; A. 21-26; lateral line 37-39; second suborbital covering  $\frac{3}{4}$  of the width of the cheek.
62. *scabripinnis intermedius* Eigenmann.
- uu.* Caudal spot not continued to the tip of the middle rays.
- B. A. 17 or 18; eye 3-3.5; interorbital 2.5; maxillary with four teeth; D. 9 or 10; scales 6-34 to 38-5. .... 63. *rubropictus* (Berg).
- BB. A. 21-24; eye 2.75-3, equals interorbital; maxillary with three teeth; D. 11; scales 6-33 to 35-4.5; lateral line extending to the caudal but sometimes interrupted on the tail; caudal spot well defined, not equal to the eye; snout wedge-shaped. .... 64. *mutator* Eigenmann.
- uuu.* No caudal spot; second suborbital narrow, usually leaving nearly half or more than half of the cheek naked.

- C. Maxillary with one tooth; five teeth in the inner row of the premaxillary; depth 2.75; A. 21 or 22; lateral line 41..... 65. *gymnogenys* Eigenmann.
- CC. Maxillary with five or six teeth; four teeth in the inner row of the premaxillary; middle point of the third mandibular tooth recurved, thorn-like; depth 2.6-2.75; A. 24.  
66. *aurorocaudatus* Eigenmann.
- CCC. Maxillary with three or four teeth; five teeth in the inner row of the premaxillary; depth 3.6; A. 22; isthmus abruptly constricted behind..... 67. *paranahybae* Eigenmann.
- cc. Second suborbital covering entire cheek; 5 teeth in the inner series of the premaxillary. Dorsal equidistant from snout and caudal. (Small species approaching Bryconamericus, reaching a maximum length of 70 mm.).
- D. Caudal band continued to the end of the caudal.
- E. Maxillary with usually 5 teeth; depth 3.3; A. 24-25; lateral line 32-34.  
68. *multidens* Eigenmann.
- EE. Maxillary with 3 teeth; depth 3.5-4; five large dentary teeth; A. 22-24; lateral line 36 or 37; caudal spot large ..... 69. *gracilior* Eigenmann.
- DD. Caudal spot if present not continued to the end of the middle rays.
- F. No humeral spot.
- G. A. 20; lateral line 32..... 70. *paucidens* (Ulrey).
- GG. A. 22-24; lateral line 38..... 71. *hasemani* Eigenmann.
- FF. A well-developed humeral band; teeth in the sides of the lower jaw minute.
- H. Depth 3.33. A. 20-22; frequently a minute caudal spot; adipose margined with black..... 72. *essequibensis* Eigenmann.
- HH. Depth 2.6-3..... 73. *guianensis* Eigenmann.
- HHH. A. 27-31; no caudal spot..... 74. *guaporensis* Eigenmann.

### 30. *ASTYANAX MICROLEPIS* Eigenmann.

Plate 48, fig. 4.

*Astyanax microlepis* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 24.

HABITAT.—Upper Cauca Basin, Ecuador.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5001 C. Type	1	88	Piedra Moler	Eigenmann
5002 C., 12769 I. Paratypes	4	48-87	Piedra Moler	Eigenmann
5003 C., 12770 I. Paratypes	∞	112 <sup>1</sup>	Cartago	Eigenmann
5004 C., 12771 I. Paratypes	50	108 <sup>1</sup>	Paila	Eigenmann
5005 C., 12772 I. Paratypes	20	99 <sup>1</sup>	Cali	Eigenmann
5006 C., 12773 I. Paratypes	∞		Cauca, near Cali	Eigenmann

Very similar to *Poecilurichthys caucanus* Steindachner, and *Astyanax fasciatus* Cuvier from which it differs in the number of scales.

Head 3.66; depth 2.8-3.2; D. 11; A. 22-25; scales 8 to 10-50 to 55-8 or 9; eye 3.33 in the head, interorbital 3.

Profile over eye depressed. Preventral area narrow, flattened, without

<sup>1</sup> Largest specimen.

a distinct median series of scales, about 17 scales in front of the ventrals; post-ventral area narrowly rounded. Predorsal area narrow, bluntly keeled, without a distinct median series of scales, about 13 scales in front of the dorsal.

Interorbital convex, smooth. Occipital process about one fourth of the length from its base to the dorsal, bordered by four or five scales along each side, usually a few small scales about its tip. Frontal fontanel narrow, triangular, not very much shorter than the parietal without its groove. Mouth small; snout pointed; second suborbital narrower than the eye, leaving a naked border around its entire margin. Maxillary not extending beyond origin of the eye; maxillary-premaxillary border angulated, equal to half the length of the head without the opercle, lower jaw short, comparatively weak. Four or five teeth in the outer row of the premaxillary, five in the inner, the lateral one minute; one tooth on the maxillary; five or six graduated teeth on the mandible in front and sometimes a few minute ones on the side.

Gill-rakers 7 + 12.

Origin of dorsal about equidistant from caudal and snout, its height 4-4.5 in the length; adipose well developed; caudal lobes 4-4.3 in the length. Origin of anal equidistant from caudal and origin or middle of pectoral. Depth of caudal peduncle 1.25-1.33 in its length. Ventrals small 1.5-1.66 in the length of the head, not reaching the anal. Pectorals reaching to or nearly to the ventrals, equal to head without snout or a little longer.

Scales very regularly imbricate, the rows not deflected toward the anal by interpolated rows; caudal naked; anal with a very narrow sheath, of one row of scales in front; a well-developed axillary scale. Lateral line but very little decurved.

A vertical humeral spot widest and most intense over the lateral line. A silvery lateral band, expanded at the end of the caudal peduncle; no spots or bands on the fins.

### 31. *ASTYANAX CORDOVAE* (Günther).

Plate 44, fig. 3.

*Tetragonopterus cordovae* GÜNTHER, Ann. mag. nat. hist., 1880, ser. 5, 6, p. 12 (Rio de Cordova); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 278; PERUGIA, Ann. Mus. civ. storia, nat. Genova, 1891, ser. 2a, 10, p. 43 (Jubibiri).  
*Astyanax cordovae* EVERMANN & KENDALL, Proc. U. S. N. M., 1906, 31, p. 82 (Rio Primero, Cordova).

HABITAT.—Western Argentina.

One specimen. 11093 I. 66 mm. to base of caudal. Rio Primero. Titecomb.

The types in the British Museum are shrunken. The three larger ones appear to be different from the five smaller, which may be *A. rutilus*. Günther's formula is certainly wrong. The scales are 8-45-6, 9-45-8, 9-43-8 in the three larger, which may be taken as the types of the species.

Head 3.75; depth 3; D. 11; A. 27; scales 8 or 9-43 to 45-7 or 8; eye 3.75; interorbital 2.6; snout about equal to the eye.

Elongate, but little compressed, deepest just behind axil; caudal peduncle deep, much compressed, its depth  $\frac{1}{3}$  of the greatest depth; ventral profile, from the origin of the pectorals to the anal, nearly straight; dorsal profile steepest to the tip of the occipital process. Preventral area broadly rounded; the scales of the median series very irregular, reduced in places to rudimentary little flaps; postventral area narrowly rounded. Predorsal area narrowly rounded; its scales regularly imbricate, there being a complete median series of scales.

Occipital process a little less than  $\frac{1}{4}$  of the distance of its base from the dorsal, bordered by four scales on each side. Interorbital broadly and evenly convex. Frontal fontanel very short,  $2\frac{1}{2}$  in the length of the posterior exclusive of the occipital groove, extending forward to above middle of eye. Second sub-orbital leaving a wide naked area all around its free border. Maxillary very oblique, equal to the eye. Mandible 2.5 in the head. Four teeth in the outer row of the premaxillary, five in the inner; teeth of the inner series very thick, the denticles arranged in a U-shaped series; four large, irregularly graduated teeth in the lower jaw. No maxillary teeth.

Gill-rakers 10 + 15, the longest not quite equal to pupil.

Scales regularly imbricate, except on the preventral area, the rows not deflected toward the anal; no auxiliary rows; lateral line but little decurved, the row of scales below it parallel with it; many concentric, few radial striae; caudal naked; anal sheath weak; axillary scale well developed.

Origin of dorsal one scale nearer tip of the snout than the ventrals, about midway of the length, penultimate ray but little less than half the length of the highest, which equals the length of the head. Anal scarcely emarginate, its origin one or two scales behind the base of the last dorsal ray. Ventrals not reaching anal. Pectoral not to ventrals.

Plumbeous, an ill-defined lateral band; a vertical humeral spot across the third and fourth scales of the lateral line; middle caudal rays dark.

Vertebrae 14 + 18.

Posterior air-bladder pointed, more than twice as long as the anterior, its diameter but little more than  $\frac{1}{4}$  of its length, regularly curved, without angular turns. Alimentary canal about equal to the total length.

32. *ASTYANAX LINEATUS* (Perugia).

Plate 44, fig. 2.

*Tetragonopterus lineatus* PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2a, **10**, p. 664 (Matto Grosso; Rio Paraguay); EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 281; BOULENGER, Trans. Zool. soc. Lond., 1896, **14**, p. 35 (San Luis).  
*Astyanax bimaculatus lineatus* EIGENMANN, Ann. Carnegie mus., 1907, **4**, p. 137 (Sapucay).  
*Astyanax lineatus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT.—La Plata Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3292 C.	14	75-116	Sapucay	Haseman
3293 C.	2	88, 114	Urucum Mts., Corumba	Haseman
5212 C.	2	140 about	Santa Cruz de la Sierra, Bolivia	Steinbach
11520 I. Paratype	1	84	Villa Maria, Rio Paraguay	Perugia
10240 I.	2	33, 40 <sup>1</sup>	Sapucay	Anisits

This species is distinguished from all other members of the genus by the brown lines between the scales. It resembles in this respect *Moenkhausia latissimus* and *M. steindachneri* as well as *Hollandichthys* and *Pseudochalceus*. This is an instance in which the same color-pattern has appeared in five different species, belonging to as many genera and subgenera.

In the Annals of the Carnegie museum I expressed the opinion that this species is a variety of *A. bimaculatus*. Through the courtesy of Dr. Gestro of the Genoa Museum I have received one of the cotypes of Perugia. Later Mr. Haseman and Mr. Steinbach collected several specimens. These show it to be distinct from Paraguay specimens of *A. bimaculatus*, in which series of dots form obscure lines along the rows of scales. In this species there are definite lines between the rows of scales.

Head 3.8; depth 2.8; D. 11; A. 26-28; scales 6 to 7-38<sup>2</sup>-5; eye 3.33; interorbital 3.

Heavy forward, tapering from ventrals to a slender caudal peduncle whose depth is about 3 in the greatest depth. Preventral region rounded, with a series of small median scales; postventral narrowly rounded. Predorsal region rounded, with an almost complete median series of scales.

<sup>1</sup> To base of caudal.<sup>2</sup> Perugia gives 34.

Occipital process about one fifth of distance from its base to the dorsal, bordered by 4 scales on the sides, of which the first is not larger than the succeeding one. Interorbital rounded. Frontal fontanel but half the length of the parietal. Second suborbital leaving a naked strip a fourth as wide as its greatest width around its entire margin. Maxillary not quite equal to the eye,  $3\frac{3}{4}$  in the head. Mandible  $2\frac{2}{3}$  in the head. Premaxillary with four teeth in an approximately straight line in the outer row, five teeth in the inner row. Maxillary with a single tooth. Lower jaw with four large teeth and some smaller ones on the side.

Gill-rakers 8 + 14.

Scales strictly cycloid, with several inconspicuous striae, everywhere very regularly imbricate, the exposed edges, at a maximum twice as high as wide; no interpolated scales or rows of scales. Anal sheath inconspicuous, of a single row of scales; axillary scale nearly as long as eye. Lateral line but little decurved, the rows of scales below it parallel with it.

Origin of dorsal in middle of body, its height 4 in the length. Origin of anal but little behind the vertical from the last dorsal ray. Anal but slightly emarginate, but its anterior rays nearly three times as long as the last; base of anal not equal to the distance from the dorsal to the tip of the adipose. Origin of ventrals below the vertical from the second scale in front of the dorsal, not quite reaching the anal. Pectorals reaching beyond origin of ventrals.

A dark, vertical humeral spot crossing the third and fourth scales of the lateral line, followed and preceded by a light area; back dark, sides and below light metallic silvery, a series of dark stripes between successive rows of scales most conspicuous along the middle of the sides; a dark band along the caudal peduncle, narrowed and continued on the middle rays; sides of head dotted.

### 33. *ASTYANAX WAPPI* (Cuvier and Valenciennes).

Plate 54, fig. 4.

*Tetragonopterus wappi* CUVIER & VALENCIENNES, Hist. nat. poissons, 1818, 22, p. 153 (Guiana); GÜNTHER, Cat. fishes Brit. mus., 1861, 5, p. 326 (British Guiana); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 278.  
*Astyanax wappi* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 133; Mem. Carnegie mus., 1912, 5, p. 355, pl. 52, fig. 1.<sup>1</sup>

HABITAT.—British Guiana.

I have examined the type (2336 Museum hist. nat. Paris) total length 105 mm. and the specimen in the British Museum.

Head 3.66; depth 3; scales 7–38–6; eye 1.5 in the very convex interorbital,

<sup>1</sup> The figure is taken from the specimen in the British Museum.



1 in the snout, 4 in the head; A. 27; maxillary with one tooth; dorsal and anal profile about equally (?) arched; second preorbital striate; a large, oval humeral spot, twice as long as high; a dark caudal spot extending forward on the sides; trace of longitudinal streaks between the rows of scales.

### 34. *ASTYANAX MUCRONATUS* Eigenmann.

Plate 53, fig. 1.

*Astyanax mucronatus* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 19; Repts. Princeton. univ. exped. Patagonia, 1910, 3, p. 433; Mem. Carnegie mus., 1912, 5, p. 354, pl. 51, fig. 1.

HABITAT.— Lower Potaro River, Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1025 C. Type	1	53	Tumatumari above the Falls	Eigenmann
1026 C., 11725 I. Paratypes	3	51–54	Tumatumari above the Falls	Eigenmann
1027 C., 11726 I. Paratypes	14	46–73	Potaro at Tukeit	Eigenmann

Head 3.6; depth 2.3–2.6; D. 11; A. 25–26, rarely 27; scales 6.–34 or 35–5 (rarely 4); eye 2.7, 2 in the head without the opercle; interorbital 3–3.5 in the head.

Compressed, subrhomboidal, with heavy head and slender caudal peduncle. Dorsal profile slightly depressed over the eye, rising with a gentle curve to the origin of the dorsal, abruptly descending to the end of the dorsal and then with a more gentle slope to the caudal peduncle. Ventral profile more regularly arched. Preventral region broadly rounded, postventral area more narrowly rounded. Predorsal area keeled, with a median series of 8 scales.

Occipital crest exceptionally narrow at the base, about one fourth of the distance from its base to the dorsal, bordered by 3 scales on the sides; skull narrow, slightly convex, smooth. Fontanels very narrow and long, the frontal fontanel as long as the parietal. Second suborbital leaving but a very narrow naked area. Maxillary but little longer than snout, 3.3 in the head. Pre-maxillary with two or three teeth in the front series, five teeth in the second series, their denticles in a straight line; two teeth on the maxillary; lower jaw with eight teeth arranged in a crescent four on each side, smaller teeth on the sides.

Gill-rakers 5 + 10.

Scales very regularly imbricate, without interpolated or omitted rows, each scale with several, slightly diverging striae; anal sheath of a single row of scales along the base of the anterior rays; caudal naked.

Origin of dorsal nearer snout than to caudal, 3.4 in the length. Anal emarginate, its origin about equidistant from snout with the 8th dorsal ray. Ventrals reaching anal, their origin a little in advance of that of the dorsal; *innominate bones protruding as spines in front*. Pectorals reaching beyond origin of ventrals.

A conspicuous bullet-shaped humeral spot, the blind end forward, a faint dark streak extending down from it; a diffuse caudal spot occupying the entire width of the end of the caudal peduncle. Dorsal line dark, sides profusely covered with pigment-cells disappearing on the belly; cheeks and opercles dotted; fins dotted, upper and lower margin of caudal dark. Straw colored in life, bases of dorsal, anal, and caudal lobes ochreous.

### 35. *ASTYANAX BREVIRHINUS* Eigenmann.

Plate 47, fig. 2.

*Astyanax brevirohinus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 96; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Rio Jequitinhonha, eastern Brazil.

One specimen. 20905 Type. About 68 mm. Rio Jequitinhonha. Hartt and Copeland.

Distinguished by its blunt snout.

Head  $3\frac{2}{3}$ ; depth 2.4; D. 11; A. 28; scales 6–35–4; eye 2.5; interorbital 3.

Compressed, dorsal and ventral profiles equally arched, the former rising to the first dorsal ray. Preventral area rounded, without a complete median series of scales; postventral area narrowly compressed. Predorsal area obscurely keeled, with a median series of about 10 scales.

Occipital process very slender,  $\frac{1}{6}$  of the distance from its base to the dorsal, bordered by  $2\frac{1}{2}$  scales on the sides. Interorbital convex. Fontanels narrow, of nearly equal width, the frontal fontanel  $1\frac{1}{3}$  in the parietal without the occipital groove, frontals not in contact in the middle. Mouth low; snout half as long as the eye, very blunt. Maxillary not quite half as long as snout and eye. Second interorbital leaving about  $\frac{1}{4}$  of the cheeks naked. Five teeth in the front row of the premaxillary, five teeth in the second row. A small tooth on the maxillaries, a second minute one on the right maxillary. Four larger teeth on the dentary and a number of smaller ones on the sides, not sharply separated from the larger ones.

Gill-rakers 6 + 10.

Scales cycloid, with several diverging striae, regularly imbricate, without interpolated scales.

Anal sheath inconspicuous, of a single series of scales on the anterior two thirds of the fin; a well-developed axillary scale. Lateral line but little decurved. Caudal sheath on the lobes half as long as the middle rays.

Origin of dorsal equidistant from snout and base of middle caudal rays, its penultimate ray about half as high as the highest, which is  $3\frac{1}{2}$  in the length. Anal emarginate, its origin under the middle of the dorsal. Ventrals reaching anal, their origin an orbital diameter nearer the upper lip than the dorsal. Pectorals reaching one or two scales beyond the origin of the ventrals.

A silvery lateral band, an obscure humeral spot; tips of middle caudal rays dark, the rest of the middle rays hyaline with traces of color, the caudal lobes opaque.

### 36. *ASTYANAX GITON* Eigenmann.

Plate 47, fig. 1.

*Astyanax giton* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 97; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Rio Parahyba, eastern Brazil.

Two specimens. 20936 Cotypes. About 68– about 78 mm. Rio Parahyba, Thayer Expedition.

These two specimens resemble *Astyanax taczanowskii* with a blunt snout. The larger may be considered the type. They differ from *A. brevirostris* in the color of the caudal and the shape of the occipital process.

Head 4; depth 2.5–2.6; D. 11; A. 23–24; scales 5–35–4; eye 2.5; inter-orbital 2.75–3.

Occipital process not nearly so narrow as in *A. brevirostris*; snout a little more than half as long as the eye; two or three teeth in the front row of the premaxillary; two teeth on the maxillary.

Gill-rakers 8 + 12.

Caudal sheath on the lobes more than half the length of the middle rays.

Dorsal nearly 4 in the length. Origin of anal under posterior part of dorsal or behind the dorsal.

A prominent humeral spot crossing the third scale of the lateral line; a large spot at base of caudal continued to the tips of the middle rays. Otherwise as in *A. brevirostris*.

37. *ASTYANAX DAGUAE* Eigenmann.

Plate 33, fig. 3.

*Astyanax daguae* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 23.*Tetragonopterus (Aequidens) fasslii* Steindachner, Denksch. K. akad. wiss. Wien, 1915, p. 48 (Western Colombia).

One specimen. 5052 C. Type. 58 mm. Dagua River at Cordova, Colombia. Eigenmann.

Head 3.75; depth 2.4; D. 11; A. 31; scales 8-35-7; eye 2.5; interorbital 3.

Premaxillary teeth four in the front row, five in the second row. Maxillary teeth 4. Mandibulary 5 and abruptly minute ones on the sides. Origin of anal under base of fourth dorsal ray.

Dorsal falcate, reaching to adipose. Pectorals reaching beyond origin of second third of ventrals. Ventrals to base of 8th anal ray; a faint, diffuse humeral band, a very narrow lateral band.

38. *ASTYANAX LONGIOR* (Cope).

Plate 69, figs. 3 and 4; Plate 85, fig. 2.

*Tetragonopterus longior* COPE, Proc. Amer. philos. soc., 1878, 7, p. 691 (Peruvian Amazon); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 278.

*Astyanax longior* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 341 (Moyabamba); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

*Astyanax pectinatus* FOWLER (*non* Cope), *Loc. cit.*, fig. 29.

HABITAT.—Marañon Basin.

I am indebted to the authorities of the Academy of natural sciences of Philadelphia for the opportunity to examine one of the two known specimens of this species.

Length 79 mm.; depth about 29; width of body 9; head 21; D. 11; A. 30; eye 6 mm.; interorbital 7 mm.; maxillary 4.5 mm.; mandible 8 mm.

Elongate, compressed. Dorsal and ventral profiles equally curved, without humps or depressions. Predorsal area narrowly rounded, with a median, not quite regular series of 13 scales from the dorsal to the occipital process.

Occipital process  $\frac{1}{2}$  of the distance from its base to the dorsal, bordered by three scales on each side. Second suborbital leaving a narrow naked border. Maxillary rather short, its anterior margin arched. Snout pointed. Three teeth in the outer series of the premaxillary, the first opposite the middle of the

second tooth of the inner series; five teeth in the inner series, their denticles in a shallow crescent. Maxillary without teeth. Mandible with four graduated teeth arranged in a crescent, and four small conical teeth on the side.

Origin of dorsal exactly equidistant from tip of snout and base of caudal. Base of anal very little more than distance from dorsal to adipose. Origin of ventrals equidistant from tip of snout and tip of last anal ray, in advance of the dorsal.

The scales are mostly gone, a few below the dorsal have about eight divergent striae. Scales about 6-34-?.

A roundish, humeral spot above the 3rd-5th scale of the lateral line, surrounded by silvery, a dark cross shade behind the silver; a silvery band; no caudal spot.

### 39. *ASTYANAX MARIONAE* Eigenmann.

Plate 52, fig. 2.

*Astyanax marionae* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 175, pl. 7, fig. 3.

HABITAT.—Upper Paraguay Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3353 C. Type	1	54	6 miles from San Luiz de Caceres	Haseman
3354 C. Paratypes	4	16-51		
3355 C. Paratypes	5	43-50	Corumba	Haseman

Head 3.5-3.75; depth 2.8-3.2; D. 11; A. 27 or 28; scales 7-35-5; eye 2.5; interorbital 3.

Slender, dorsal and anal profiles gently and equally curved. Ventral areas rounded. Preventral area without a distinct median series of scales. Predorsal area with about ten scales.

Occipital process about one fifth of the space between its base and the dorsal. Interorbital but slightly convex. Frontal fontanel but little shorter, but much narrower than the parietal. Second suborbital leaving a narrow naked margin. Maxillary slender, one half the length of the snout and eye. Four teeth in the front row of the premaxillary, five in the second row. Maxillary with one small tooth. Mandible with four large teeth in front and several abruptly minute ones in each dentary.

Gill-rakers 8 + 11.

Scales regularly imbricate, no interpolated rows. Lateral line somewhat decurved. Anal with a sheath of a single row of scales along the base of the anterior rays. Scales with a few faint radial striae.

Origin of dorsal about equidistant from snout and caudal, highest dorsal ray 4 in the length. Caudal lobes about 3.5 in the length. Origin of anal under last caudal ray. Ventrals vary, reaching the anal. Pectorals scarcely to the ventrals.

Highly iridescent silvery; a bright silvery lateral band, a faint humeral band, no caudal spot.

Differing from *A. guianensis* in the partially naked cheek, etc.

For Marion Durbin Ellis, collaborator in monographing the minute Tetra-  
gonopterinae.

#### 40. *ASTYANAX RUBERRIMUS* Eigenmann.<sup>1</sup>

Plate 44, fig. 1; Plate 49, figs. 2 and 3.

*Astyanax ruberrimus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 25.

*Astyanax aeneus*? REGAN (*non* Günther), Ann. mag. nat. hist., 1913, ser. 8, 12, p. 465.

HABITAT.— Pacific slope of Colombia and both slopes of Panama.

<sup>1</sup>Since the account of *A. ruberrimus* was prepared Mr. S. F. Hildebrand has examined several thousand specimens of *Astyanax* collected in Panama on both the east and west slope. They came from the Chagres River of the Atlantic side and from both the Mamoré Basin and Tuyra Basin of the Pacific side. He has come to the conclusion that there are two species of *Astyanax* in the fresh-waters of Panama. One of these is the widely distributed *A. fasciatus* (Cuvier) which is abundant in the Atrato River of the Atlantic drainage of Colombia occurring in very small numbers in the head-waters of the San Juan of the Pacific side of Colombia. This species is the one described by Steindachner as *fischeri* and by Meek as *grandis* from the Mamoré Basin. The second species is the *ruberrimus* of the San Juan and other Pacific streams of Colombia. All of the specimens enumerated below belong to this second species but are more slender. They have the shape of *A. fasciatus* and the color of *ruberrimus*. In representing them I used the figures of *fischeri* published by Steindachner but modified the color-markings (pl. 49, fig. 2, 3). This was at a time when I supposed that but one species *A. fischeri* existed in the Mamoré and that the specimens enumerated belonged to that species. It would seem therefore that either the specimens enumerated below should be listed under *ruberrimus* or that they represent a variety without a name. The name *fischeri* is a synonym of *fasciatus*.

The specimens erroneously identified as *A. fischeri* are:—

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20686	7	65-92	Rio Obispo	Steindachner
20687	8	75-92	Rio Obispo	Steindachner
20688	40	17-36	Panama	Steindachner
11490 L.	3	54-about 70	Panama	Bransford
11491 L.	2	46, 63	Panama	Bransford

It is possible that some of the younger ones, (20688) in which the caudal spot is continued to the end of the middle caudal rays are in reality *A. fasciatus*.

Mr. S. F. Hildebrand, in his volume on the fishes of Panama records this species from a great variety of localities on both slopes of the Canal Zone and from the Mamoré and Tuyra Basins of the Pacific slope of Panama south of the Canal Zone.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4912 C. Type	1	107	Istmina	Eigenmann
4913 C., 12751 I.	$\infty$	113 <sup>1</sup>	Istmina	Eigenmann
Paratypes				
4914 C., 12752 I.	7	113 <sup>1</sup>	Betw. Puerto Negria & Istmina	Eigenmann
Paratypes				
4915 C., 12753 I.	$\infty$	94 <sup>1</sup>	Puerto Negria	Eigenmann
Paratypes				
5093 C., 12851 I.	12	69-93	Cordova	Eigenmann
5394 C., 13087 I.	2	125 <sup>2</sup>	Rio San Juan, mouth of Rio Cacurupi	Henn
5395 C.	1		Rio Calima, near Boca del Dineho	Henn
5397 C., 13089 I.	5		Rio San Juan, mouth of Rio Manguido	Henn
5396 C., 13088 I.	$\infty$		Istmina	Wilson
5402 C., 13094 I.	13		Rio Telembi; 8 m. above Barbacoas	Henn & Wilson
5204 C., 13096 I.	3		Rio Telembi	Henn & Wilson
5399 C., 13091 I.	39		Barbacoas	Henn & Wilson
5401 C., 13093 I.	8		Above Barbacoas	Henn & Wilson
5403 C., 13095 I.	15		Rio Telembi, San Lorenzo	Henn & Wilson
5400 C., 13092 I.	39		Creek Altacar, Barbacoas	Henn & Wilson
5405 C., 13097 I.			Patia, mouth of Rio Guaitara	Henn
5406 C., 13098 I.			Rio Magui	Henn
5407 C., 13099 I.			Patia between Magui & Telembi	Henn
5398 C., 13090 I.	27		Tado	Wilson

Head about 4; depth 2.2-2.75; D. 11; A. 23-28; scales 7-35 or 36-7; eye 3 in the head; interorbital 2.4-2.5.

Deep and robust; ventral profile a little more arched than the dorsal, and a little more regular. Preventral area broad, slightly flattened, with a median series of about 14 scales; postventral area rounded. Predorsal area keeled, with about 11 median scales.

Occipital crest about 4 in the distance from its base to the dorsal, bordered by three scales on each side. Interorbital smooth, convex. Frontal fontanel narrow, about half as long as the parietal without the groove. Naked margin around the free border of the second suborbital about one fourth as wide as the suborbital. Maxillary equals snout, 4 in the head. Four teeth in the outer

<sup>1</sup> Largest specimen.<sup>2</sup> Larger specimen.

series of the premaxillary, five in the inner; one or two broad tipped maxillary teeth. Mandible with four large teeth and about seven small ones on the side.

Gill-rakers 7 + 11.

Scales cycloid, with numerous slightly diverging striae, regularly imbricate, except along the anal, where they are a little disarranged. Anal sheath very low, of a single series of scales. Lateral line but little decurved, the row of scales below it parallel with it; a large axillary scale.

Origin of dorsal equidistant from tip of snout and caudal or a little nearer the former, its anterior rays 3.4 in the length. Caudal about 3.5 in the length. Anal slightly emarginate, its highest ray equals length of head without snout, its origin behind the vertical from the last dorsal rays. In the young, ventrals reach anal, and pectorals the ventrals which they do not do in the adult.

A conspicuous black spot occupying the entire width of the caudal peduncle in the young, somewhat narrower in the adult, not continued on the middle rays; a faint vertical humeral spot. Base of dorsal yellow, shading into brick-red; middle of caudal yellow the rest brick-red; base of anal brick-red.

Several specimens from various places on the San Juan in the British Museum probably belong to this species. In the absence of material for comparison, they were not identified with certainty when they were referred to me a few years ago.

#### 41. *ASTYANAX RIBEIRAE* Eigenmann.

Plate 55, fig. 2.

*Astyanax ribeirae* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 177, pl. 8, fig. 2.

HABITAT.—Southeastern Brazil.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3368 C. Type	1	66	Xiririca	Haseman
3369 C. Paratypes	56	26–82	Morretes	Haseman
3370 C. Paratypes	27	26–50	Iporanga	Haseman
3371 C. Paratypes	8	13–73	Xiririca	Haseman
3372 C. Paratypes	4	61–75	Xiririca	Haseman
3373 C.	11	40 <sup>1</sup>	Iguape	Haseman

<sup>1</sup> Largest specimen.



Head 4.25-4.2; depth 2.5-3; D. 10; A. 23-27<sup>1</sup>; scales 6 or 7-34 to 38<sup>2</sup>-5 or 6; eye 2.75-3 in the head, a little less than or equal to the interorbital.

Compressed, dorsal and ventral profiles equally arched. Snout blunt, profile slightly depressed over the eye. Preventral area rounded, without a regular median series of scales; postventral area narrowly rounded. Predorsal area inconspicuously keeled, with a median series of about ten scales.

Occipital process bordered by three scales on each side, one sixth of the distance from its base to the dorsal. Interorbital convex. Frontal fontanel much shorter than the posterior without the groove. Second suborbital leaving a naked area about one third as wide as the bone. Maxillary equal to the snout in length, its margin very convex. Premaxillary with three teeth in the front series, five 5-pointed teeth in the second. Maxillary with two teeth. Dentary with seven or eight graduated teeth.

Gill-rakers 8 + 14.

Scales regularly imbricate, no interpolated rows. Anal sheath of a few scales along the base of the anterior rays. Lateral line complete; each scale with several radial striae.

Origin of dorsal midway between tip of snout and base of upper caudal rays. Origin of anal below or behind the base of the last dorsal ray. Dorsal pointed, the highest ray 3.5-4 in the length. Anal emarginate. Caudal about 3.5 in the length. Origin of ventrals in front of the vertical from the origin of the dorsal. Ventrals not reaching anal. Pectorals not to ventrals.

Humeral spot large, on about six scales above the 3d-5th scales of the lateral line and with an extension toward the scapular process. Caudal spot large and well defined, covering the entire width of the caudal peduncle; bases of middle caudal rays included in the spot which does not extend to the ends of these rays. The specimens collected December 8th at Xiririca are much lighter, the markings less well defined.

This species is closely allied to *A. mutator* and *A. intermedius*.

#### 42. ASTYANAX METAЕ Eigenmann.

Plate 87, fig. 4.

*Astyanax metae* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 11; 1920, no. 44, p. 11 (Rio Castaño, Rio Bue, Rio Tiguirito, Rio Tuy, Rio Tapa Tapa (all near Caracas) Lake Valencia, Venezuela).

HABITAT.—Eastern slopes of the eastern Cordilleras of Colombia; Venezuela.

<sup>1</sup> One with 23, two with 24, nine with 25, two with 27.

<sup>2</sup> Three with 34, five with 35, three with 36, two with 38.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5457 C. Type	1	130	Rio Negro <sup>1</sup>	Gonzales
5458 C., 13153 I. Paratypes	6	103-130	Rio Negro <sup>1</sup>	Gonzales
13153 I.	4	largest 132	Rio Negro <sup>1</sup>	Gonzales
13265 I.	3	largest 135	Quebrada Cramalote <sup>1</sup>	Gonzales
13790 I.	1	83	Cumaral <sup>2</sup>	Maria
13782 I.	1	112 <sup>3</sup>	Caño Carneeria <sup>2</sup>	Maria
13371 I., 13264 I.	20	largest 146	Barrigon	Gonzales

Head 4+; depth about 2.5; D. 11; A. 29, 31, 25, 29, 28, 30, 30 in seven specimens taken at random. Scales 8-40-6, 9-40-6, 9-41-6, 8-40-6, 8-40-7 in five specimens. Eye 1 in snout, 3.5-3.7 in head, 1.3-1.5 in interorbital; depth of caudal peduncle 2 in head.

Compressed, rather heavy forward. Preventral area rounded, with small scales and without a distinct median series. Predorsal area bluntly keeled, with a median series of 10 or 11 scales.

Occipital process extending about one fourth of the distance to the dorsal, bordered by four scales on each side. Skull convex. Parietal fontanel about twice as long as the frontal. Second suborbital convex, leaving a naked area of equal width about its entire border, except below the angle in front where the naked space is a little wider. Premaxillary with four teeth in the outer series, four or five in the inner, when five the lateral one minute. Maxillary with a single tooth; maxillary a trifle longer than the eye. Each ramus of the mandible with four large teeth and a few similar minute ones on the side.

Gill-rakers slender, about a third as long as eye, 14 on the lower arch.

Origin of dorsal fully an orbital diameter nearer the eye than the caudal; highest ray of dorsal equal to the length of head or a little shorter. Adipose fin well developed; caudal lobes longer than the head. Origin of anal under base of last dorsal ray. Ventrals scarcely reaching anal, their origin slightly in advance of the vertical from the first dorsal ray. Pectorals reaching at least to the origin of the ventrals.

Lateral line but slightly decurved. Scales regularly imbricate except over the anal muscles and here the irregularity is slight. A sheath of a single row of scales along the anal. Base of caudal similarly sheathed; a large axillary scale.

<sup>1</sup> At Villavicencio, at the base of the Andes, east of Bogota.

<sup>2</sup> North of Villavicencio.

<sup>3</sup> To base of caudal.

Faint traces of lines following the scales. No humeral spot; a large dark band extending from the tips of the three rays above the middle of the caudal to their base, expanding on the caudal peduncle and downward and forward, fading out above the origin of anal.

Closely allied to *A. maximus*, differing from all other species in the oblique band on the tail.

#### 43. ASTYANAX MAXIMUS (Steindachner).

Plate 87, figs. 1-3.

*Tetragonapterus maximus* STEINDACHNER, Ichthyol. beitr., 1875, 4, p. 43, pl. 7 (Tullumayo; Monterico); 1876, 6, p. 6 (syn.); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 276; ?Perugia, Ann. Mus. civ. storia nat. Genova, 1897, ser. 2, 18, p. 25 (Alto Beni).

*Astyanax maximus* ?FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 342 (Peruvian Amazon); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

*Tetragonopterus alasa* GÜNTHER, Ann. mag. nat. hist., 1876, ser. 4, 17, p. 399 (Monterico, Peru).

*Tetragonopterus rutilus* STARKS (non Jenyns), Proc. U. S. N. M., 1906, 30, p. 777 (Rio Perené).

HABITAT.—Mountain streams of eastern Peru.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
13762 I.	1	116	Yahuarmayo, Peru	Purchase of Rosenberg
— Field Mus.	12	97-133	Moyobamba, July, 1912	Osgood & Anderson

I have examined one of the specimens mentioned by Fowler. It has the origin of the dorsal equidistant from the snout and the caudal, and I am in doubt whether it is *A. maximus*. It is very probably a form of *A. fasciatus*.

Head 4.5; depth 2.5; D. 11; A.  $\frac{28}{4}$ ,  $\frac{30}{3}$ ; scales 7 or 8-38 to 40-6; eye 3.3 in the head, 1.5 in interorbital. Depth of caudal peduncle 2 in the head.

Pectorals reaching ventrals or shorter, ventrals to anal or shorter.

A large, obscure, vertical humeral spot; faint dark stripes between two rows of scales. A large caudal spot, abruptly narrowed and continued to the end of the middle caudal rays; otherwise no oblique band above anal as in *metae*.

#### 44. ASTYANAX REGANI Meek.

Plate 61, fig. 3.

*Astyanax regani* MEEK, Field mus. Publications, 1909, 7, p. 207 (Las Cañas); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

*Astyanax globiceps* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Pacific slope of Panama, Costa Rica.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality
6257 Field Mus. Type	1	130+	Las Cañas, Costa Rica
6023 Field Mus.	1	103	Pacific Slope of Panama

I am indebted to the late Mr. Seth E. Meek for the privilege of examining these specimens.

Head 4.66; depth about 3.33; D. 11; A. 27; scales 8-39-6; eye 3.5; interorbital 2.5.

Elongate, heavy forward. The head short and blunt. Preventral area broadly rounded, without a median series of scales, postventral area *broadly rounded*. Predorsal area rounded, with a partially complete series of ten median scales.

Occipital process  $\frac{1}{5}$  the distance from the base of the occipital process to the dorsal, bordered by 3 scales on the side. Interorbital very convex. Frontal-fontanel one third as long as the parietal. Snout short and blunt. Maxillary not quite equal to length of eye. Second suborbital leaving a naked space equal to  $\frac{1}{3}$  its own width. Premaxillary with four teeth in each series. Maxillary with two teeth. Dentary with four large graduated teeth in front and several smaller ones similar to the last of the four larger on the sides.

Gill-rakers short, about 6 + 11.

Dorsal a little nearer snout than caudal, its height about  $\frac{1}{5}$  in the length. Caudal about equal to length of head. Origin of anal below the tip of the last dorsal ray. Ventrals below the second scale in front of the dorsal, reaching a little more than halfway to anal. Pectorals reaching  $\frac{2}{3}$  to ventrals.

Scales thin, cycloid, rather irregularly placed on the belly; no interpolated scales on the sides. An exceedingly low anal sheath. Caudal naked; a very short and broad axillary scale. Lateral line but little deurved.

Silvery, an obscure vertical humeral spot, a plumbeous lateral band; a caudal spot, middle caudal rays dark.

45. *ASTYANAX ALBEOLUS* Eigenmann.

## Plate 49, fig. 1.

*Astyanax oerstedii* MEEK (*non* Kröyer), Field mus. Publications, 1907, 7, p. 145, in part (Turrialba; Rio Siguire; Rio Machucha).

*Astyanax albeolus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 97; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Costa Rica.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality
6241 Field Mus.	2	116	Rio Machucha, Costa Rica
Type & Paratype			
6267 Field Mus.	3		Chitaria, E. slope Costa Rica
6361 Field Mus.	1		Siguares, E. slope D'Alfaro, Costa Rica

Head 4.5; depth 2.66; D. 11; A. 26; scales 7-38-7; eye equals snout, 3.5 in the head; interorbital  $\frac{1}{2}$  the head behind the second narcal opening; second suborbital leaving one third of the cheek naked.

Snout rounded; postventral area broadly rounded, dorsal more than an orbital diameter nearer the snout than to the middle caudal rays; pectorals reaching within two scales of the ventrals.

A vertically oval humeral spot, the ventral prolongation scarcely evident, crossing the 3d and 4th scales of the lateral line. Dorsal whitish with very few chromatophores; anal lobe without chromatophores, the rest of the fin with a few; caudal spot extending to the end of the fin.

Very closely related to if not identical with *A. regani*.

The above description is based on the type.

The paratype in the Field Museum also 6241 has the eye 3 in the head, longer than the snout, the anal with 30 rays. The dorsal a little nearer the caudal than in the type, the second suborbital leaves a much narrower naked area than in the type.

46. *ASTYANAX NICARAGUENSIS* Eigenmann and Ogle.

Plate 66, figs. 5-7.

*Astyanax rutilus nicaraguensis* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 23 (Nicaragua).

*Astyanax fasciatus nicaraguensis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 133.

HABITAT.—Nicaragua.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
55653 U.			Nicaragua	Bransford
11486 I.	4	57-67 about	Nicaragua	Bransford

Maxillary slender, having 2-8 teeth. In the latter case the teeth extending along more than half the length of the bone. Of thirty-five specimens, there

are nine with two teeth, two with three, five with four, five with five, five with six, five with seven, three with eight, and one with nine on the maxillary.

Three have twenty-seven anal rays, twelve twenty-eight, eight twenty-nine, ten thirty, three thirty-two; average twenty-nine.

It is possible that the specimens with numerous maxillary teeth are all males.

In general characters the specimens agree with the specimens of *A. acneus*, and those with but two maxillary teeth are indistinguishable from them. The fact that such a large per cent of specimens have a large number of maxillary teeth entitles them to a separate name.

The Field Museum contains numerous specimens collected in Lake Nicaragua (S. E. Meek).

#### 47. ASTYANAX ANGUSTIFRONS (Regan).

*Tetragonopterus angustifrons* REGAN, Biología Centrali Americana. Fishes, 1907, p. 172, pl. 26; fig. 5 (Mexico).

*Astyanax angustifrons* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Some part of Mexico.

Head  $3\frac{2}{3}$ –4; depth 3; D. 11; A. 26–29; scales 7 or 8–34 to 38–6 or 7; eye 3 in head, interorbital  $3\frac{1}{3}$ – $3\frac{1}{2}$ .

Snout subconical,  $\frac{2}{3}$  as long as eye. Maxillary extending to the vertical from anterior edge of pupil; three to five maxillary teeth. Origin of dorsal behind ventrals, its longest ray  $\frac{3}{4}$  to  $\frac{1}{2}$  in the head; free edge of fin slightly convex. Anal slightly emarginate; Pectoral  $\frac{2}{3}$  the head, about reaching ventrals which extend nearly to anal; caudal peduncle longer than deep. Coloration as in *A. mexicanus*.

#### 48. ASTYANAX FASCIATUS (Cuvier).

Plate 45, fig. 1–7; Plate 49, fig. 2, 3; Plate 50, fig. 2; Plate 95, fig. 1.

*Chalceus fasciatus* CUVIER, Mem. Mus. hist. nat., 1819, 5, p. 352, [? pl. 26, fig. 2] (Brazil); SCHOMBURGK, Fishes Brit. Guiana, 1811, 1, p. 215 (Paduirí).

*Tetragonopterus fasciatus* CUVIER & VALENCIENNES, Hist. nat. poisson, 1848, 22, p. 149 (Rio San Francisco); GÜNTHER, Cat. fishes Brit. mus., 1861, 5, p. 322 (Brazil; ?West Ecuador; ?Rio Chisoy; ?Mexico; Guatemala); Ann. mag. nat. hist., 1880, ser. 5, 6, p. 12 (La Plata); PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2, 10, p. 44 (Candelaria); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1893, 16, p. 55; EIGENMANN & KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 521 (Arroyo Pypucu; Arroyo Chagaldina); BOULENGER, Boll. Mus. univ. Torino, 1897, 12, no. 279, p. 3 (Lesser); VAILLANT, ?Bull. Mus. hist. nat., 1897, 3, p. 221 (Chagres); 1899, 5, p. 155 (Rio Carnot).

- Astyanax fasciatus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 346 (Para); EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 131 (Asuncion; Villa Rica); Rept. Princeton univ. Exped. Patagonia, 1910, 3, p. 432.
- Tetragonopterus rutilus* JENYNS, Zool. Beagle. Fishes, 1842, p. 125, pl. 23, fig. 2 (Parana); STEINDACHNER, Ichthyol. notizen, 1869, 9, p. 10, pl. 2, fig. 2, 3 (Montevideo); HENSEL, Wieg. archiv., 1870, p. 80; STEINDACHNER, Süßw. südöstl. Bras., 1876, 3, p. 575, pl. 2, fig. 1, 2 (Rio Parahyba; Rio Doce; Montevideo; Rio de Janeiro; Rio Jequitinhonha; Xamapa, Mexico); Denksch. K. akad. wiss. Wien., 1880, 42, p. 22 (Cauea); BOULENGER, Proc. Zool. soc. Lond., 1887, p. 281 (Canelos); Ann. mag. nat. hist., 1887, ser. 5, 19, p. 173; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; CORE, Proc. Amer. philos. soc., 1894, 33, p. 87 (Rio Grande do Sul); ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 280; PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2, 10, p. 44 (Resistencia & Laguna Ibera; Candelaria; Buenos Aires); EIGENMANN, Ann. N. Y. acad. sci., 1891, 7, p. 633 (Rio Grande do Sul); LAHILLE, Rev. Mus. de la Plata, 1895, 6, p. 7 (Puertoviejo; Arroyo de Gato; Doña Flora; Dock Central; Isla Santiago; Punta Lara); BOULENGER, Boll. Mus. univ. Torino, 1897, 12, no. 279, p. 4 (Caiza; Mission de San Francisco; San Lorenzo), 1898, 13, p. 2 (Rio Peripa; Rio Zamora; Rio Santiago); EIGENMANN & NORRIS, Revista Mus. Paulista, 1900, 4, p. 357 (Taubaté; Rio Tieté).
- Astyanax rutilus* EVERMANN & KENDALL, Proc. U. S. N. M., 1906, 31, p. 82; FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 435 (Rio Grande do Sul); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 19 (Cordova; Rio Tieté; Rio Grande, trib. of Parana; Rio Camaguam; Rio Grande do Sul; Piracicaba; Taubaté; Asuncion; Villa Rica; Arroyo Chagalalina; Bahia Negra; Para; Napo or Marañon; Truando; West coast Central America); RIBEIRO, Kosmos, 1908, no. 1 (Rebeira Baixa).
- Tetragonopterus taeniatus* CUVIER & VALENCIENNES (*non* Jenyns), Hist. nat. poissons, 1848, 22, p. 145 (Mana; Surinam).
- Tetragonopterus viejita* CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, 22, p. (Lake Maracaibo).<sup>1</sup>
- Tetragonopterus scabripinnis* KNER (*non* Jenyns) Characinen, 1859, p. 39 (Xamapa, Mexico; Irisanga); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 323 (Bahia).
- Tetragonopterus aeneus* HENSEL (*non* Günther) Wieg. archiv., 1870, p. 87 (Southern Brazil).
- Astyanax carolinae* GILL, Proc. Acad. nat. sci. Phil., 1870, p. 92 (Napo or Marañon).<sup>2</sup>
- Tetragonopterus carolinae* EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 279.
- Tetragonopterus eucieri* LÜTKEN, Overs. K. Dan. selsk. Forh., 1874, p. 131 (Rio San Francisco; Rio das Velhas and tributaries); LÜTKEN, Vidensk. selsk., 1875, 12, p. 210, pl. 5, fig. 12 (Rio das Velhas).
- Astyanax eucieri* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 19 (Rio das Velhas).
- Tetragonopterus örstedii* LÜTKEN, Vidensk. medd. nat. for. Kjöb., 1874, p. 229 (Rio San Juan, Central America); ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 274.
- Astyanax rutilus oerstedii* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 22 (Nicaragua).
- Tetragonopterus panamensis* GILL (*non* Günther), Proc. Acad. nat. sci. Phil., 1876, p. 336 (Rio Frijoli); STEINDACHNER, Flüssf. Südamer., 1879, 1, p. 18, pl. 1, fig. 1, 2 (Rio Mamoré); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; 1893, 16, p. 55.
- Tetragonopterus fischeri* STEINDACHNER, Flüssf. Südamer., 1879, 1, p. 18 (Rio Mamoré, Panama).
- Astyanax fischeri* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 26 (Pacific slope of Panama; Rio Frijoli; Empire Station, Panama); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.
- Astyanax jequitinhonhae* EIGENMANN & NORRIS (*non* Steindachner), Revista Mus. Paulista, 1900, 4, p. 357 (Piracicaba).
- Tetragonopterus petenensis* GÜNTHER, Ann. mag. nat. hist., 1880, ser. 5, 6, p. 12 (*non* Günther 1864) (Rio Negro, Argentina).
- Tetragonopterus copei* ULREY, in part (*non* Steindachner), Ann. N. Y. acad. sci., 1895, 8, p. 282 (Brazil; Lower Amazon).
- Astyanax grandis* MEEK, Field mus. Publication, 1912, 10, p. 67 (Pacific coast streams of Panama).

<sup>1</sup> I examined the specimen, 8656, in the Jardin des Plantes. It is recorded as from Bresil Merid. Aug. St. Hilaire, Aout, 1822. Lat. line about 35; A. about 25. The specimen is stuffed and varnished and it is impossible to say what may have been its original proportions. Dorsal behind the ventrals. A caudal band to end of middle rays.

<sup>2</sup> Gill assigns the following characters to his *A. carolinae*: — Maxillary ceases in front of the vertical from the pupil and end of first suborbital. Dorsal considerably behind origin of ventrals; pectorals reaching beyond ventrals. Eye about equal to the slightly convex interorbital, 3 in the length of the head. Depth  $2\frac{3}{4}$ ; head  $3\frac{2}{3}$ ; A. 26; scales 6.5–37 or 38–5; a humeral spot.

HABITAT.—BUENOS AIRES to Mexico, in nearly all streams of the eastern slope from Para to the Napo; western Colombia and western Central America. Locally absent.

Steindachner (Ichthyol. notizen, 1869, 9, p. 8) states that the description of Cuvier and Valenciennes (Hist. nat. poissons, 22, p. 352) was not based on Cuvier's original specimens of *A. fasciatus* and that he secured three specimens from Montevideo which agreed in all respects with Cuvier's description.

Later Steindachner (Süsswf. südöstl. Bras., 1876, 3, p. 20) examined specimens from Rio Janeiro, Rio Parahyba, and Rio Jequitinhonha.

It is quite certain that the first mentioned three specimens are not identical with those recorded later. The figure, showing a blunt snout and the description of the teeth, especially the statement that the inner series of the premaxillary is composed of four teeth, leave no doubt whatever that the specimens mentioned by Steindachner in the Notizen are *Bryconamericus iheringii*. Nor are the later of Steindachner's specimens the *A. fasciatus* of Cuvier. Cuvier (Mem. Museum histoire naturelle, 1819, 5, p. 352-353, pl. 26, fig. 2), described two species as follows:—

#### SUR DEUX NOUVEUX CHALCEUS.

La première de ces espèces, que je nommerai *Chalceus opalinus*,\* \* \* Ce poisson est originaire des rivières du Brésil, d'où il a été envoyé avec beaucoup d'autres productions par M. Auguste de Saint-Hilaire.

La seconde espèce que j'appellerai *Chalcée à bandes*, *Chalceus fasciatus*, a été rapportée du même pays par M. Delalande, employé de notre Muséum.

Sa couleur paroît avoir été roussâtre, avec deux bandes longitudinales noirâtres, dont la supérieure commence près de l'opercule par une grosse tache ronde de la même couleur, et se prolonge jusque sur le milieu de la caudale; l'inférieure se termine au-dessus de la fin de l'anale.

Mon individu n'a que 5 pouces de long; je lui trouve 4 dents à la première rangée de chaque intermaxillaire et autant à la seconde, mais plus larges. Celles des maxillaires sont imperceptibles. A la mâchoire inférieure il y en a 8 en avant, larges et dentelées comme celles du deuxième rang d'en haut, et ensuite de chaque côté 10 ou 12 très-petites. Les sous-orbitaires sont légèrement striées; les operclees sont lisses; les écailles sont de grandeur moyenne: j'en compte 40 sur la rangée moyenne, et environ 12 rangées. La ligne latérale est un peu au-dessous du milieu de la hauteur. Ses pores ne sont pas branchus. La dorsale est à peu près sur le milieu et un peu pointue. Elle a 11 ou 12 rayons. L'adipéuse est extrêmement petite. Les pectorales sont médiocres, pointues et de 13 à 14 rayons. Les ventraux sont petites, sous la dorsale, de 8 rayons. L'anale est longue, de 18 rayons, La caudale fourchue, de 24.

Cuvier & Valenciennes, Hist. nat. poissons, 22, p. 149, state:—

Les premiers examplaires apportés à M. Cuvier viennent du Rio San Francisco, par M. de Saint-Hilaire.

I examined the only specimens marked *A. fasciatus* preserved in the Jardin des Plantes. They are 8653 and 8654, 87 mm., 110 mm., and 115 mm. long. These are labeled as having been sent by Saint-Hilaire from the Rio San Francisco, 1820, and are undoubtedly the specimens mentioned by Cuvier & Valen-



ciennes. It appeared that these specimens were received from another collector a year after the publication of the original description of *A. fasciatus*.

Dr. Pellegrin has kindly written me that the date 1820 does not preclude one of the specimens being the type, for it probably only indicates the date of registering. Also that the type of *Chalceus opalinus* credited in Cuvier's description to Saint-Hilaire, was, in reality collected by Delalande in Rio de Janeiro. There seems to be no doubt, therefore, that Cuvier inadvertently exchanged the names of the collectors of his *A. opalinus* and *A. fasciatus* and there is every reason to believe that one of the three specimens mentioned by Cuvier and Valenciennes served Cuvier as the type of *A. fasciatus*. His statement, that his specimen was but 5 inches long, can apply only to the largest of the three specimens.

These specimens are stuffed and lacquered so that none of the characters can be made out clearly but they are evidently the recently described *A. rutilus*, and not the short analed *fasciatus* of Steindachner.

This species, the most widely distributed of the characins, has been and is giving rise to a number of distinct forms by isolation in different rivers. Steindachner says, "Almost every river system possesses a peculiar variety of this species; according to age, sex, season; according to abundance or scarcity of food; according to the habitat in cool or clear mountain brooks or deeper stagnant waters the outlines of the body vary and in part also the number of horizontal rows of scales and of the anal rays."

Some of the forms have differentiated far enough to be universally considered as distinct species. Such are the *A. mexicanus* reaching the United States, and the *A. aeneus* of Central America; to these should probably be added *A. parahybae*. Of equal value are *A. scabripinnis* and *A. jenynsii* of southeastern Brazil. Aside from these there are a number of statistical forms such as can only be differentiated if a comparatively large number of specimens are examined in each locality. The Rio Novo for instance has a well-marked variety of this sort. In an examination of the material in the U. S. N. M. *A. nicaraguensis* from Lake Nicaragua was thus defined as another one of them, but at that time the southern varieties were not distinguished because there was not enough material from the southern localities. Whether we call these forms species, varieties or do not recognize them as worthy of name, the fact remains that different rivers are inhabited by individuals that in the aggregate differ from the individuals of another river — that we have here a series of species in the making as the result of segregation.

The following table (p. 297) shows the variation of the species in the number of anal rays and scales in the lateral line in different localities. The numbers in the different lines indicate the number of specimens from the particular locality possessing the character indicated at the head of the column.

In southeastern Brazil, *Astyanax fasciatus* is found associated in the same rivers with *A. taeniatus* and its variations and with *A. scabripinnis* and its varieties. While in any particular stream, it is comparatively easy to distinguish between them each undergoes so many modifications in different rivers that it is not possible to give a clear definition that will distinguish the species when specimens from all the rivers are considered. *Astyanax fasciatus* is a long analed, slender, sharp-snouted species that about Rio de Janeiro grades in the number of its anal rays and in its shape perfectly into *A. taeniatus* which on an average is a shorter analed, deeper, sharp-snouted species. South of Rio Janeiro it grades into *A. eigenmanniorum* the still deeper substitute of *A. taeniatus* of the northern rivers. *Astyanax taeniatus* in its turn grades into *A. scabripinnis*, a slender, short-analed, heavy-jawed species. The latter and its varieties are always readily distinguishable from *A. fasciatus*; but *A. taeniatus* may sometimes be taken for *A. scabripinnis* on the one hand, or for *A. fasciatus* on the other. Lütken figured both *A. scabripinnis* and *A. taeniatus* as his *A. scabripinnis rivularis*. Jenyns in the original descriptions of *A. taeniatus* and *A. scabripinnis* recognizes the former as an intermediate form.

The matter is complicated by the fact that different river systems have different varieties of the several species and by the fact that if we imagine *A. fasciatus*, *A. taeniatus*, and *A. scabripinnis* to form a triangle *A. intermedius* would occupy the center of it.

The maze was disentangled with the Thayer material. Three years later, after the Thayer material had been returned, the large collections of Haseman became available for study. This separate study has had its advantages and disadvantages. I confess that after three years I had to approach the question of the species practically *ab initio*. I think a reduction in the number of accepted species would have been justified. It is, however, always easier to confuse facts than to disentangle them and very few changes have been made in the conclusion first reached.

Table showing the number of specimens of the same species from different localities and of different species having the number of anal rays and the number of scales in the lateral line indicated in the top line.

	ANAL RAYS													LATERAL LINE												
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	
1. <i>fasciatus</i> and varieties																										
Rio San Francisco																										
Jequitinhonha																										
Rio Doce																										
Rio Novo																										
Parahyba																										
La Plata & Uruguay																										
Rio Grande do Sul																										
Para																										
Truando																										
Nicaragua																										
2. <i>nicaraguensis</i>																										
3. <i>ancus</i>																										
Perez																										
Rio Managua																										
Motagua																										
El Hule																										
4. <i>mexicanus</i>																										
5. <i>macrophthalmus</i>																										
6. <i>signummaritimum</i>																										
7. <i>tacnitiatus</i> (Haseman coll.)																										
<i>tacnitiatus</i> (Thayer exped.)																										
8. <i>reticularis</i>																										
9. <i>scabrifrons</i>																										
Parahyba																										
Rio Janeiro																										
10. <i>scabrifrons intermedius</i> <sup>1</sup>																										
Parahyba																										
Mucuri																										

<sup>1</sup> These numbers do not include the specimens collected by Haseman for the details of which see under this variety.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20962	1	86	Santa Anna	Don Pedro II
21039	3	46—about 60	Rio San Francisco	Allen & St. John
21040	9 <sup>1</sup>	115–144	Rio San Francisco	Allen & St. John
20912	1	96 <sup>3</sup>	Bahia	Hartt & Copeland
20922, 20924	2 <sup>2</sup>	71–98 <sup>3</sup>	Rio San Francisco, below the falls	Hartt
21030, 21031	2	82 & 122	Bon Jardine	Allen & St. John
21027	2	129–137	Rio das Velhas	Allen & St. John
21036	3	97–115	Rio San Francisco	Allen & St. John
21048	17	90–124	Rio San Francisco	Williams
21049	5	about 38–65	Rio San Francisco	Williams
21034	many	poor	Rio San Francisco	Allen & St. John
21039	3	47–59	Rio San Francisco	Allen & St. John
21049	5	40–70	Rio San Francisco	Williams
826	1	138	Rosario	Brooks
836	3	112–117	Buenos Aires	Brooks
9262 I., 9285 I.	5	87–99 <sup>3</sup>	Piracicaba	von Ihering
11633 I.	4	91–126	Piracicaba	von Ihering
20870	2	133–140	Buenos Aires	Wheatland
11367 I.	2	59—about 105 <sup>3</sup>	Buenos Aires	W. B. Scott
20898	1	about 117	Itabapuana	Hartt & Copeland
2418	1 <sup>2</sup>	115	Rio Una	A. de Lacerda
21078	73	81–125	Rio Novo	Thayer Exped.
20695	14	126–170	Rio Grande do Sul	Dom Pedro II
847	18	45–117	Uruguay River	Wyman
20913	5 <sup>4</sup>	56–67	Jacurpe and Posuca Rio	Hartt & Copeland
10296 I.	2	29–32 <sup>3</sup>	Villa Rica	Anisits
9998	1	41 <sup>3</sup>	Arroyo Chagalalina	Anisits
11487 I.	2	103–135 <sup>3</sup>	Truando	Miehler & Schott
11492 I.	3	66–84 <sup>3</sup>	Central America	
20971	1	140	Cudajas <sup>5</sup>	Thayer Exped.
10787 I.	1		Rio Camaguam, Rio Grande do Sul	von Ihering
10788 I.	2 <sup>6</sup>	60–78	Tieté	von Ihering
4887 I.	12	42–103	Rio Grande do Sul	von Ihering
10112 I.	1	31	Arroyo Pypucu	Anisits
1000	1		Puerto Suarez	Steinbach
20699	1	56	Goyaz	Honorio
11634 I.	3	99–110	Castro Est. Paraná	von Ihering

<sup>1</sup> Cuvieri.<sup>2</sup> 20924 and 2418 have two maxillary teeth.<sup>3</sup> To base of caudal.<sup>4</sup> All have 2 maxillary teeth, 3 teeth in front row of premaxillary, gill-rakers 5 + 11, depth 2.75; eye equals interorbital; A. 24, 25, 25, 26, 26.<sup>5</sup> A. 27; lateral line 46; a male.<sup>6</sup> Gill-rakers 5 + 11, 8 + 12.

Mr. Haseman collected the following specimens for the Carnegie Museum:—

A. Rio San Francisco.

Catalogue number	Number of specimens	Size in mm.	Locality
3413	5	88-108	Penedo
3414	50	39-75	Penedo
3415	50	48-102	Joazeiro
3416	6	58-86	Cidade da Barra
3417	6	36-71	Januaria
3418	6	70-92	Pirapora

B. Rio das Velhas

3419	3	67-97	Rio das Velhas
3420	1 <sup>1</sup>	61	Sete Lagoas

C. Salitre Basin.

3421	3	42-44	Rio Salitre
3422	4	40-58	São Thomé

D. Lagoas near Barra

3423	17	60-75	Lagoa Pereira
3424	1	77	Lagoa de Porto
3425	3 <sup>2</sup>	51-71	Barreiras

E. Rio Grande Basin of the Rio San Francisco.

3426	8	18-82	Rio Sapon
3427	9	largest 70	Santa Rita

F. Basin of the Rio Itapicurú.

3428	3	48-73	Rio Itapicurú, 6 miles north of Bom Fin
3429	18	26-120	Queimadas
3430	4	poor	Rio Ipome
3431	1	poor	Rio Paguis, Baixa Grande
3432	1	72 <sup>3</sup>	Rio Coite
3433	1	85	Samaron
3434	5	65-111	Jacobina

G. Rio Catu.

3435	14	31-84	Alagoinhas
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H. Rio Doce.

3436	30	14-87	Rio Doce
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<sup>1</sup> In all but the anal rays this specimen agrees with others referred to *intermedius*.

<sup>2</sup> One typical in shape, with anal rays 26; one deep. A. 25; one intermediate A. 28.

<sup>3</sup> To base of caudal.

## I. Rio Ribeira.

Catalogue number	Number of specimens	Size in mm.	Locality
3437	8	57-104	Iporanga
3438	2	101-108	Xiririca

## J. Eastern slope of Rio Grande do Sul.

3439	90	40-63	Porto Alegre
3440	12	one 58 the rest 120-152	Porto Alegre
3441	3	60-97	Cachoeira
3442	13	41-92	Cacequy

## K. Parana Basin.

3445	2	largest 52	Bridge of Goyaz, Paranahyba
3446	2 <sup>1</sup>	138-153	Bon Jardin, Minas, Rio Grande below waterfall
3447	33 <sup>2</sup>	33-124	São João del Rei, Rio Grande
3448	10 <sup>3</sup>	63-98	Jaguara, Rio Grande
3449	89 <sup>4</sup>	24-76	Mogy das Cruzes
3450	1	133	Piracicaba
3451	118 <sup>5</sup>	largest 78	Salto Avanhandava, above the fall
3452	24 <sup>6</sup>	largest 68	Salto Avanhandava

## K. Uruguay Basin.

3443	42	20-103	Uruguayana
3444	3	89-110	La Plata, Buenos Ayres
3321	3		Buenos Aires, Rio da Prata

## M. Paraguay Basin.

3320	9	largest 95	Sapucay
3453	3	57-60	Rio Iauru

The following specimens from Colombia west of the eastern Cordilleras differ considerably in shape. Some specimens from Apulo and Quibdo have the depth equal to one third of the length. In other places they are always deeper, and most of the specimens from the localities mentioned are deeper. There are usually six scales between the dorsal and lateral line in the Upper Atrato, seven in the Magdalena and eight in the Upper Cauca. The pores number 38 or 39

<sup>1</sup> A. 34, 26. Lateral line 38.<sup>2</sup> A. 22, 23, 24, 62, 27.<sup>3</sup> A. 25, 26, 28.<sup>4</sup> A. 24, 25, 26, 27.<sup>5</sup> Depth 2.3-3; A. 26, 27, 28, 29, 31.<sup>6</sup> Depth 2.4-3.25.

in the Upper Atrato, 36-37 (rarely 40) at Soplaviento and 39 to 41 in the Upper Cauca.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4899 a-z C., 12739 I.		largest 68	Quibdo	Eigenmann
4900 a-e C., 12740 I.	6	largest 151	Boca de Certegui	Eigenmann
4901 a-b C., 12741 I.	12	largest 164	Raspadura	Eigenmann
4902 a-e C., 12742 I.	40	largest 151	Paila	Eigenmann
4903 a C.	1	103	Piedra Moler	Eigenmann
4904 a-d C., 12743 I.	12		Cauca at Cali	Eigenmann
4905 a-e C., 12744 I.	10	largest 123	Cartago	Eigenmann
4906 a-j C., 12745 I.	100	largest 112	Soplaviento	Eigenmann
4907 a-b C.	2	32 and 36	Calamar	Eigenmann
12746 I.	1	40	Puerto Wilches	Eigenmann
4908 a C.	1	44	Puerto Berrio	Eigenmann
4909 a-j C., 12747 I.	100	largest 79	Peñas Blancas	Eigenmann
4910 a-r C., 12748 I.	38	largest 46	Honda	Eigenmann
4916 C., 12754 I.	50+	largest 90	Girardot	Eigenmann
4911 a-o C., 12749 I.	100+	largest 97	Bernal Creek	Eigenmann
12750 I.	Several	largest 95	Apulo	Gonzales
13036 I.	1		Manigru	Wilson
5385 C., 13077 I.	Several		Truando	Wilson
5386 C., 13078 I.	Several		Quibdo	Wilson
5361 a-e C., 13037 I.	Several	75-170	Certegui	Wilson
5362 a C., 13038 I.	2	80-92	Condoto	Wilson
5363 a-x C., 13039 I.	Several	largest 128	Raspadura	Wilson

I have also had access to the specimens recorded by Meek and Hildebrand in their Fishes of Panama. They came from Rios Capeti, Cupe, Grande, Yape, Aruza, and Tuyra all of the Tuyra Basin; from Rios Calobre, Mamoré, El Capitan, Juan Diaz Abaco, and Marte Arnade.

I shall first describe typical specimens coming from the Rio San Francisco and the Parana Basin, calling attention to the local deviations later.

Head about 4.3; depth 2.6-3; D. 11; A. 25-34;<sup>1</sup> scales 7-34 to 41<sup>2</sup>-6 to 7; eye 2.5-3; interorbital slightly wider than the eye in the adult.

Nearly symmetrically elliptical, without humps or depressions; preventral area rounded, without a distinct median series of scales; postventral area narrowly keeled; predorsal area narrowly keeled or rounded, with a series of about 12 nearly regular median scales.

Occipital process  $\frac{1}{5}$  of the distance of its base from the dorsal, bordered by

<sup>1</sup>See tables for details.

<sup>2</sup>46 scales in a specimen from Cudajas.

four scales on the side. Interorbital evenly rounded; frontal fontanel narrow,  $1\frac{1}{2}$  in the parietal fontanel; maxillary equal to the snout, much shorter than the eye; second suborbital rounded, leaving a considerable naked area all around, which is widest at the ends of the bone; four or five teeth in the front row of the premaxillary, five in the second; a single tooth in the maxillary, four large slightly graduate teeth and a number of small ones in each dentary.

Gill-rakers 8, 16, the longest a little more than  $\frac{1}{3}$  of the eye.

Scales thin, cycloid, somewhat caducous, those above the lateral line with 2-8 striae, regularly imbricate, no interpolated rows below the lateral line and but few extra scales at base of anal; <sup>1</sup> anal sheath low, of a single series of scales; caudal naked except just at the base; a large axillary scale; lateral line but little decurved, the scales below it parallel with it.

Origin of dorsal midway between tip of snout and base of upper caudal lobe, or a little nearer the former; origin of ventrals and third scale in front of the dorsal equidistant from tip of snout; origin of anal a little behind vertical from base of last dorsal ray; dorsal more than 4 in the length; anal slightly emarginate, its base equal to the distance from the base of the last dorsal ray to the origin or tip of the adipose; pectorals reaching ventrals; ventrals not to anal.

A silvery lateral band; a faint vertical humeral spot over the 3rd and 4th scales of the lateral line; the silvery band becoming black on the caudal peduncle and continued as a black streak to the end of the middle rays; anal hyaline, with minute chromatophores toward the ends of the membranes, its anterior ray and tips of a few succeeding ones milk-white.

Some specimens, 20875, probably from Lagoa Santa have a comparatively short and thick body; A. 25 and 26. Small specimens from Villa Rica, 10296 I, Arroyo Pypucu, 10112 I, and Arroyo Chagalalina, 9998 I, have no differentiated humeral spot, the chromatophores being evenly distributed.

In the larger of two specimens from Tieté (10788 I. ♂ 77 mm.) the scales are greatly striate (10-17 striae), the depth is 2.5; A. 23; scales 5-35-4 to base of ventral, 5 to anal; in the small (59 mm.), the scales have from 3-7 striae; depth 2.66; A. 25; scales 5-35-4 to base of ventral. Caudal nearly plain.

In specimens from the Rio Novo, 21078, the most frequent number of anal rays is 27 (25-29) instead of 32 in those from the Parahyba, and the most frequent number of scales in the lateral line is 35 or 36 with 5 between the lateral line and the ventrals, instead of 39 and 40 with 6 or 7 between it and the ventrals in *A. parahybæ*.

<sup>1</sup> In two of the specimens from the Uruguay there are interpolated rows.



Depth 2.4–2.6. Gill-rakers 9.15.

There are no interpolated scales below the lateral line and the series are therefore not deflected toward the anal.

Margin of the anal and caudal and middle rays of the latter are dark, the dorsal largely speckled. There is either no milk-white tip to the anal or this spot, when it is rarely indicated is much smaller than in specimens from the Parahyba.

49. *ASTYANAX FASCIATUS HETERURUS* Eigenmann.

Plate 89, fig. 3.

*Astyanax heterurus* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 11.

HABITAT.—Truando River.

Two specimens 5392 C. Type about 50 mm. and 13085 I. paratype about 46 mm. Truando. Wilson.

Head 3.25; depth 3.25; eye 2.75 in the head, about equal to the interorbital.

Origin of dorsal equidistant from tip of snout and base of middle caudal rays; pectorals about equal to head without opercle, reaching past origin of ventrals; ventrals slightly beyond origin of anal; anal falcate, its highest ray reaching to the last fourth or fifth of the base of the fin.

A vertically elongate humeral spot; a small round spot on the end of the caudal peduncle; color of caudal unique for the genus. Middle caudal rays black to near their base, margins of the fin black, the lower wider and more conspicuous and connected with the black of the middle caudal rays by a short black bar across the base of the lower lobe.

This species, evidently very closely related to *A. fasciatus*, is readily distinguished by the peculiar color of the caudal.

50. *ASTYANAX FASCIATUS PARAHYBAE* Eigenmann.

Plate 46, fig. 7.

*Astyanax fasciatus parahybae* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 97; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Parahyba, eastern Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20635 Cotypes	27	95-138 about	Rio Parahyba	Agassiz & Bourget
27412	2	95 <sup>1</sup> -129	Rio Parahyba	Agassiz & Bourget
20890	4	83-103	Mendez	Hartt & Copeland
20891	2	70-80	Mendez	Hartt & Copeland
20893 } 20894 part }	3	34-54	Muriahe	Hartt & Copeland
9268 I.	1		Taubaté	Von Ihering
3357 C.	73 <sup>2</sup>	40-85	Campos	Haseman
3358 C.	20 <sup>3</sup>	38-64	São João da Barra	Haseman
3359 C.	4 <sup>4</sup>	55-79	Lagoa Feia	Haseman
3360 C.	4 <sup>5</sup>	38-45	Entre Rios	Haseman
3361 C.	2 <sup>6</sup>	76-82	Jacarehy	Haseman

The specimens from the Parahyba Basin differ from typical *A. fasciatus* in so many and so striking respects that they may also be distinguished by a varietal name.

Head 4.25-4.4; depth 2.5-2.66; D. 11; A. usually 31 or 32, (27-34); lateral line usually 39 or 40 (37-41); eye equals interorbital, less than 3 in the head; one maxillary tooth; 4 or 5 teeth in the outer row of the premaxillary in the ratio of 2:1.

Gill-rakers 9 + 16.

Rows of scales below the lateral line deflected towards the anal by interpolated rows of scales, the first of the interpolated rows beginning at a point above the middle of the ventrals and one or two rows of scales below the lateral line.

Tips of dorsal, caudal rays, and anal usually dark; tips of ventrals, more rarely dark; the tips of the pectorals also dusky; middle caudal rays dark; tips of first two rays of the anal milk-white.

51. *ASTYANAX FASCIATUS JEQUITINHONHAE* (Steindachner).

Plate 50, fig. 3.

*Tetragonopterus jequitinhonhae* STEINDACHNER, Süßw. südöstl. Bras., 1876, **3**, p. 27, pl. 2, fig. 3 (Jequitin-honha); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 280.

*Astyanax fasciatus jequitinhonha* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Eastern Brazil.

<sup>1</sup> To base of caudal.

<sup>2</sup> A. 30, 30, 30, 32, 29, 29, 31, 29, 30.

<sup>3</sup> A. 31, 29, 30, 30.

<sup>4</sup> A. 30, 31, 28, 29.

<sup>5</sup> A. 25-27. Four others from this place are doubtful. They are small and the scales are lost.

<sup>6</sup> A. 28, 30.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20916	20	62	Rio Arassuahy	Hartt & Copeland
20901	10	55-92	Rio Jequitinhonha	Hartt & Copeland
20903	8	69-89	Rio Jequitinhonha	Hartt & Copeland
20906	1	95	Rio Jequitinhonha	Hartt & Copeland
20907	1	79	Rio Jequitinhonha	Hartt & Copeland
20908	4	36-60	Rio Jequitinhonha	Hartt & Copeland

As Steindachner has pointed out, the specimens from the Jequitinhonha are certainly slenderer than typical *A. fasciatus* from the Parana and Rio San Francisco, from which they also differ in the shorter lateral line.

Depth 2.75-3; D. 11; A. 25-30, most frequently 28; scales 6-34 to 37 (usually 36)-4 or 5 to the ventrals.

Gill-rakers 9 + 14, 9 + 13, 6 + 12, 7 + 13, 8 + 14, 8 + 13 in different specimens.

No interpolated rows of scales.

Fins hyaline or dusky; median caudal rays dark or rarely hyaline; tips of first two fully developed anal rays sometimes milky white.

To this variety should perhaps also be referred:—

ten specimens 20911, 65-115 mm. Rio Doce, between Linhares and Porto Souza. Hartt & Copeland, and two specimens 20883, 65-78 mm. São Matheos. Hartt & Copeland.

These specimens are in rather bad condition. They differ from *A. jequitinhonhae* in the increased number of gill-rakers (10 + 16 to 18, Rio Doce; 6 to 9 + 12-17, São Matheos). Head 4; depth 2.8-3 $\frac{1}{5}$ ; D. 11; A. 26-29; eye 2.5-3 in the head.

52. *ASTYANAX FASCIATUS MACROPHthalmus* Regan.

## Plate 49, fig. 6.

*Astyanax aeneus* MEEK (*non* Günther), Publication Field Columbian mus. zool., 1904, 5, p. 86 (in part) (Motzorongo).

*Astyanax rutilus* var. EIGENMANN & OGLE, Proc. U. S. N. M., 33, p. 23 (Mexico; Motzorongo; Vera Cruz).

*Astyanax macrophthalmus* REGAN, Biologia Centrali Americana, Fishes, 1908, p. 169, 171, pl. 26, fig. 4 (Motzorongo).

*Astyanax fasciatus macrophthalmus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Southern Mexico.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
43597 U.	2		Mexico	Duges
44946 U.	1		Vera Cruz	Herrera
11448 I., 10928 I.	4	71-81	Motzorongo	Meek
11493 I.	2	67-84	Mexico	Meek

Depth 2.75-3; A. 26-31; scales 7 or 8-37 or 38-5 to the ventrals; eye 2.75.

In one the interorbital is distinctly less than the diameter of the eye, in the other just equal to it; the maxillary about equal to the eye; the pectorals extend a little beyond the origin of the ventrals.

A caudal band and a humeral spot.

53. *ASTYANAX FASCIATUS AENEUS* (Günther).

- Tetragonopterus aeneus* GÜNTHER, Proc. Zool. soc. Lond., 1860, p. 319 (Oaxaca, Mexico); KNER & STEINDACHNER, Abhandl. Bayer. akad. wiss., 1864, **10**, p. 46 (Rio Chagres)<sup>1</sup>; GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 326 (Oaxaca); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; EIGENMANN, *Loc. cit.* 1893, **16**, p. 55; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 280; JORDAN & EVERMANN, Bull. 47, U. S. N. M., 1896, **1**, p. 333; VAILLANT, Bull. Mus. hist. nat., 1897, **3**, p. 221 (Rio Chagres)<sup>1</sup>; MEEK, Field Columbian mus. Publication, 1904, **5**, p. 86 (Lowland streams south of the city of Vera Cruz and of the Rio Balsas). *Astyanax rutilus aeneus* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 24 (Perez; Sulphur River; El Rancho, Rio Tenedores; Rio Kilagua; Rio Gualan; Rio Motagua; Rio Managua; Los Amates). *Astyanax fasciatus aeneus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433. *Tetragonopterus panamensis* GÜNTHER, Cat. fishes Brit. mus., 1861, **5**, p. 321 (Pacific coast of Panama<sup>2</sup>; Yzabal). *Tetragonopterus brevinotus* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 325 (Rio San Geronima); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 55. *Tetragonopterus humilis* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 327 (Lake Amatitlan, Guatemala); ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 276. *Tetragonopterus finlimus* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62 (Chinantla, Guatemala); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1903, **9**, p. 325. *Astyanax finlimus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 344, fig. 32 (Central America). *Tetragonopterus belizianus* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62 (Beliza); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1903, **9**, p. 326. *Tetragonopterus cobancensis* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62 (Hte. Vera Paz Coban); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1903, **9**, p. 324. *Tetragonopterus oaxacensis* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62.

HABITAT.—Panama to Mexico.

<sup>1</sup> The only species of *Astyanax* found by Meek and Hildebrand in the Chagres is *A. ruberrimus*.

<sup>2</sup> The specimen of *T. panamensis* from the Pacific coast of Panama is probably *T. ruberrimus* or *T. fasciatus*.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
25291	3	82-86	Rio Tanateneo near Tonola, Chapas	Sumichrast
10929 I.	14	38-75	Perez	Meek
11129 I.	2	92, 113 about	Sulphur River	Miller
11130 I.	3	64-103	Rio Motagua at El Rancho	Miller
11131 I.	2	45, 116	Rio Tenedores at Tenedores	Miller
11132 I.	7	40-101	Rio Kilagua at Los Amates	Miller
11135 I.	1	114	Rio Kilagua at Los Amates	Miller
11133 I.	45	35-96 about	Rio Gualan at Gualan	Miller
11134 I.	60	42-99	Rio Motagua at Gualan	Miller
11136 I.	6	60-88	Rio Managua at Algeria	Miller
11137 I.	4	64-74	E. of Los Amates	Miller
11138 I.	1	56	E. of Los Amates	Miller

There seems to be no doubt but that *Tetragonopterus belizanus* 5224 and 5225, Museum Histoire Naturelle, 12 specimens, and *T. finitimus*, 5223, Guatemala, 2 specimens, are typical *A. aeneus*. They have A. 27, 26, 27, 28, 30.

This species differs from typical *A. faseiatus* in the thicker body, more slender caudal peduncle, and in having usually 2 maxillary teeth.

For the details of the anal fin see the table (p. 297). While there is no difficulty in distinguishing this species from *A. macrophthalmus* it is impossible to assign any character to it that will at all times distinguish it from typical *A. faseiatus*.

54. *ASTYANAX MEXICANUS* (Filippi).

## Plate 49, figs. 4 &amp; 5.

*Tetragonopterus mexicanus* FILIPPI, Rev. et mag. zool., 1853, p. 166; STEINDACHNER, Ichthyol. notizen, 1869, **9**, p. 11, pl. IV, figs. 1-4 (Lake Mexico; Izucar); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 55; ULREY, Ann. N. Y. acad. sci., **8**, 1895, p. 282; JORDAN & EVERMANN, Bull. 47 U. S. N. M., 1896, **1**, p. 335; JORDAN & SNYDER, Bull. U. S. fish comm., 1900, **19**, p. 125 (Rio Ixtla; Puente de Ixtla; Morcos); MEEL, Field Columbian mus. Publication, 1902, **3**, p. 86, (Puente de Ixtla; Balsas; Cuicatlan; Venta Salada); 1904, **93**, (Rio Balsas and Rio Tehucan to the Rio Grande).

*Astyanax mexicanus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 345 (Monterey; Rio Ixtla; Rio Verde); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 25 (Texas; Rio Nueces; Devil's River; Rio Leona; Comanche Springs; Eln Creek; Brownsville; Rio Seco; Caderita; China near Leon; Stockton; Rio Grande; Matamoras; Las Moras; Fort Clark; Monterey; Mexico); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

*Astyanax argentatus* BAIRD & GIRARD, Proc. Acad. nat. sci. Phil., 1854, **7**, p. 27; GIRARD, U. S. & Mex. bound. surv., 1859, p. 74 (Rio Nueces; Rio Leona; Zoquito; Comanche Springs; Eln Creek; San Felipe; Devil's River; Brownsville; Mouth of Rio Grande; Rio Sabinal); GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 380; GARMAN, Bull. M. C. Z., 1881, **8**, p. 92 (Tributaries of Lago de Muerté and springs near Monclava).

- Tetragonopterus argentatus* JORDAN & GILBERT, Syn. fishes N. Amer., 1882, p. 255; EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 56; EVERMANN & KENDALL, Bull. U. S. fish comm., 1891, **12**, p. 105 (Rio Nueces; Rio Leona; Rio Sabinal, mouth of the Rio Grande; Zoquito; Comanche Springs; Elm Creek; Turkey Creek; San Felipe; Devil's River; Brownsville); Woolman, Bull. U. S. fish comm., 1894, **14**, p. 60 (Rio Chihuahua); ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 282; JORDAN & EVERMANN, Bull. 47 U. S. N. M., 1896, **1**, p. 336; JORDAN & SNYDER, Bull. U. S. fish comm., 1901, **19**, p. 125 (Rio Verde near Rascon; Rio Tamesoe); MEEK, Field Columbian mus. Publication, 1902, **3**, p. 86 (Chihuahua; Santa Rosalie; Jimenez); COCKERELL, Univ. Colorado studies, 1908, **5**, p. 172. (North Spring River, Roswell, New Mexico).
- Tetragonopterus petenensis* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 326 (part) (Lake Peten); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 55; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 280.
- Tetragonopterus nitidus* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62 (Cuernavaca, Mexico); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1902, p. 324.
- Tetragonopterus fulgens* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9** (Cuernavaca); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1902, p. 324.
- Tetragonopterus streetsii* COPE, Proc. Acad. nat. sci. Phil., 1871, p. 218 (Coatzacoalecos River).

HABITAT.—Rio Grande Basin north to Roswell, New Mexico south to the Balsas and Papaloapam, Lake Peten.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20872	3	41-50	Matamoras	
10922 I.	5	48-69	Garza Valdez	Meek
10923 I.	5	45-79	Monterey	Meek
10924 I.	1	85	Lerdo	Meek
10925 I.	8	33-76	Rascon	Meek
10926 I.	6	74-99	Cheitta	Meek
10927 I.	7	60-88	Yantepee	Meek
10921 I.	8	53-80	Victoria	Meek
11489 I.	2	59, 66	Mexico	Meek
11485 I.	5	70-83	Fort Clark	Mearns
3490 I.	1	60 <sup>1</sup>	Texas	Mearns
4864 I.	1	46	Chihuahua	Woolman

In distribution this species begins where *A. acneus* leaves off. It is found from the Balsas and Papaloapam north to Texas. It is more slender than *A. acneus* and has fewer anal rays, but does not materially differ in other respects.

Usually 4 teeth in the outer series of the premaxillary, 1 to 3 teeth in the maxillary.

For the details of the anal see page 297.

First few anal rays without pigment, the first two milk-white toward their tips.

55. *ASTYANAX TAENIATUS* (Jenyns).

Plate 47, figs. 3 & 4.

- Tetragonopterus taeniatus* JENYNS, Zool. Beagle. Fishes, 1812, p. 126 (Loeogo Province, Rio de Janeiro); GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 329.

<sup>1</sup> To base of caudal.

*Astyanax taeniatus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 431.

*Tetragonopterus fasciatus* STEINDACHNER (*non* Cuvier), Süßw. südöstl. Bras., 1876, **3**, p. 20, pl. 1, fig. 3, in part (Rio de Janeiro; Rio Parahyba; Rio Jequitinhonha); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 283.

HABITAT.—Costal streams from Bahia to Santos and Rio das Velhas.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20635	4	36–49 <sup>1</sup>	Parahyba	Agassiz & Bourget
20889	1	68 <sup>1</sup>	Itabapuana	Hartt & Copeland
20878, } 20880 part }	26	65 largest	São Matheos	Thayer Exped.
21079	4	72–84	Rio Novo	Thayer Exped.
21080	2	43	Rio Novo	Thayer Exped.
20931	1	96	Rio Parahyba	Thayer Exped.
21061	2	95, 97	Rio de Janeiro	Thayer Exped.
20934	1	74 <sup>1</sup>	Mendez	Thayer Exped.
20888	1	133	Mendez	Hartt & Copeland
3374 C.	5	24–40 about	Rio das Velhas	Haseman
3375 C.	1	70	Rio das Velhas	Haseman
3376 C.	1	40	Alagoinhas, Rio Catu	Haseman
3377 C. <sup>2</sup>	40	40–63	Muniz Freire, Rio Itapemerim	Haseman
3378 C.	1	45	Rio Pelad, near Santos	Haseman

Jenyns described two small fishes “evidently distinct from either of the last two species, *A. fasciatus* and *A. scabripinnis* the characters of which are in some measures combined in them.”

He gives the scales as 7–40–6; A. 3–22; general form of *A. fasciatus*; fourteen or more teeth in the lower jaw; ventrals in exact line with the origin of the dorsal; depth 3 to base of caudal fork.

I have a number of specimens that evidently belong to this species. The scales are, however, never more than 39 in the lateral line, while the ventrals in a few specimens are immediately below the origin of the dorsal; they are in front of the dorsal in most cases. They are identical with Steindachner's *A. fasciatus* which is not the *A. fasciatus* of Cuvier.

Head 4.2–4.3; depth 2.5–2.33; D. 11; A. 21–24<sup>3</sup>, rarely 19 or 20; scales 5 or 7–32 to 39–4 or 5; eye 3–3.25 in the head; interorbital 2.5–3.

Premaxillary teeth three in the front row and five in the back; two maxillary teeth. Dentary teeth not abruptly smaller on the sides, more graduate, approaching Deuterodon.

Gill-rakers 8 + 13.

<sup>1</sup> To base of caudal.

<sup>2</sup> A.  $\frac{22}{1}$ ,  $\frac{23}{6}$ ,  $\frac{24}{1}$ ,  $\frac{25}{3}$ ,  $\frac{26}{3}$ ,  $\frac{28}{1}$ .

<sup>3</sup> Of the specimens mentioned above 20880 has but 19 anal rays, 20889 has depth 2.25.

Scales fewer, 32-34 in the specimens (21080 and 21079) north of the Parahyba.

Origin of ventrals and origin of dorsal, or second scale in front of the dorsal, equidistant from tip of snout; origin of anal and third scale behind the dorsal equidistant from snout.

A faint, vertical humeral spot; middle caudal rays dark.

Very closely allied to these is *A. eigenmanniorum*.

56. ASTYANAX EIGENMANNIORUM (Cope).

Plate 48, figs. 1, 2.

*Tetragonopterus eigenmanniorum* COPE, Proc. Amer. philos. soc., 1891, **33**, p. 89 (Rio Grande do Sul); FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 316 (Rio Grande do Sul).

*Astyanax eigenmanniorum* EIGENMANN, Rept. Princeton univ. exped. Patagonia, **3**, 1910, p. 434.

*Tetragonopterus maculatus lacustris* EIGENMANN, Ann. N. Y. acad. sci., 1891, **7**, p. 633 (in part) (Rio Grande do Sul).

*Astyanax fasciatus* EVERMANN & KENDALL, Proc. U. S. N. M., 1906, **31**, p. 81 (Rio Primero).

*Astyanax rutilus* EIGENMANN & OGLE (*non* Jenyns), Proc. U. S. N. M., 1907, **33**, p. 20 (Tieté, Rio Grande do Sul).

HABITAT.—Rio das Velhas, South to Rio Grande do Sul; Sapucay, Paraguay and Cordova, Argentina.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4488 I.	10	75-95	Rio Grande do Sul	Von Ihering
9294	1	73 <sup>1</sup>	Rio Grande do Sul	Von Ihering
11107	4	48-82 about	Rio Primero, Cordova	Titcomb
3384 C.	5	76-111	Sapina, São Paulo	Haseman
3385 C. <sup>2</sup>	73	135 <sup>3</sup>	Porto Uniao, Rio Iguaçu	Haseman
3386 C.	1	37	Cacequy	Haseman
3387 C.	90	40-63	Porto Alegre	Haseman
3388 C.	10	49-80	Cachoeira	Haseman
3389 C. <sup>4</sup>	90	35-106	Bebedouro, Rio Pardo	Haseman
3390 C.	2	52, 64	Sapucay, Paraguay	Haseman
3391 C. <sup>5</sup>	16	29-63 about	Sete Lagoas	Haseman
3392 C. <sup>6</sup>	19	18-60	Rio das Velhas	Haseman
3393 C. <sup>7</sup>	4	85-125	Rio das Velhas	Haseman
3394 C. <sup>8</sup>	13	48-87	Cachoeira, Rio Jacuhy	Haseman

<sup>1</sup> To base of caudal.

<sup>2</sup> 19, 20, 21, 22, 23, 24, 25, 26, number of anal rays.  
1 1 3 3 4 1 5 1 number of specimens.

Scales in four specimens 35, 36, 37, 38.

<sup>3</sup> Largest specimen.

<sup>4</sup> A.  $\frac{24}{3}$ ,  $\frac{25}{1}$ ,  $\frac{26}{3}$ ,  $\frac{27}{1}$ , Teeth 4-4, 3-3, 4-4 in the first row of the premaxillary of three specimens.

<sup>5</sup> Depth 2.2-2.5 (2.8 in one), A.  $\frac{23}{3}$ ,  $\frac{25}{2}$ ,  $\frac{26}{5}$ ,  $\frac{27}{1}$ . Those with A. 23 and 26 are certainly alike.

<sup>6</sup> A.  $\frac{21}{1}$ ,  $\frac{22}{3}$ ,  $\frac{23}{4}$ ,  $\frac{24}{2}$ .

<sup>7</sup> A. 25 in all four.

<sup>8</sup> A.  $\frac{26}{3}$ ,  $\frac{27}{1}$ ,  $\frac{28}{1}$ ,  $\frac{29}{1}$ ,  $\frac{30}{1}$ . Scales  $\frac{34}{1}$ ,  $\frac{35}{1}$ ,  $\frac{36}{2}$ ,  $\frac{39}{1}$ . Depth 2.5-2.7.





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VOL. XLIII. PART 4.

# THE AMERICAN CHARACIDAE.

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CARL H. EIGENMANN.

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WITH TWENTY-FOUR PLATES.

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Head 4; depth 2.5; D. 11; A.<sup>1</sup> (in 4888 and 9294) one with 23, two with 24, five with 25, one with 26, one with 27, and one with 28; scales 6 (rarely 7) — 33 in two, 34 in one, 35 in three, 36 in two — 5 to the ventrals.

Usually four teeth<sup>1</sup> in the outer row of the premaxillary (usually 3 in *A. taeniatus*) five in the second row; maxillary with a single tooth (2 in *A. taeniatus*). Four graduated teeth in the dentary, abruptly followed by minute ones on the side.

Gill-rakers 8-10 + 15 or 16; suborbital leaving a border of variable width around its free margin.

Scales with 2-4 (rarely 9) striae; no interpolated rows above the anal.

An obscure, vertical, humeral spot and evident median caudal band; fins in Rio Grande specimens otherwise hyaline (the dorsal and anal and tips of caudal with numerous chromatophores, which expanded, might make these fins dusky). Dorsal and anal and tips of all the caudal rays dark in specimens from the Rio Primero.

Other specimens that should probably be referred here are: — one specimen 10777 I. 113 mm. Santos. Von Ihering.

Premaxillary teeth with four teeth in the front row, maxillary with a single tooth. Dorsal, anal, tips and middle caudal rays dark; A. 24; scales 6-35-5.

Three specimens 9267 I. Tieté 90, 87, 99 mm. (to base of caudal).

A single maxillary tooth; four or five (on one side of one specimen but three) teeth in the front row of the premaxillary. Two of these, approaching closest to the Santos specimen, reach the extreme in depth of the *A. fasciatus* of the *Tetragonopterus* series.

Depth 2.25; scales 6-34-5; A. 24 and 26; gill-rakers 10 + 15 or 16; the scales are multistriate, the number of striae reaching as high as 14 on some scales. The third specimen approaches more nearly a typical *A. rutilus*, with depth  $2\frac{3}{4}$ ; scales 6-36-5; A. 27; scales with 3-10 striae.

The color is as in the Santos specimens.

## 57. *ASTYANAX SCABRIPINNIS* (Jenyns).

Plate 46, figs. 4-6.

*Tetragonopterus scabripinnis* JENYNS, Zool. Beagle. Fishes, 1842, p. 125, pl. 23, fig. 3 (Rio de Janeiro); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 325; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; EIGENMANN, Proc. U. S. N. M., 1893, 16, p. 55; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 279; RIBEIRO, Kosmos, 1908, 1 (Rio Bethany).

<sup>1</sup> Evermann and Kendall give for ten specimens of the Rio Primero of which 11107 above is part, one with 20 rays, six with 21, one with 22, and two with 25.

*Astyanax scabripinnis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.  
*Tetragonopterus jenynsii* STEINDACHNER, Süßw. südöstl. Bras., 1876, **3**, p. 22, pl. 3, fig. 1, 2 (Rio Parahyba); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 283.

HABITAT.—Rio Parahyba, Rio de Janeiro, and Rio Bethany, eastern Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20873	18	82-104	Rio de Janeiro	Thayer Expedition
20885	1 ♀	114 about	Mendez	Hartt & Copeland
20927	2	100, 103	Rio Parahyba	Thayer Expedition
20929	3	75-84	Rio Parahyba	Thayer Expedition
20937 part	8	75-117	Rio Parahyba	Thayer Expedition
20938	2	79, 81	Rio Parahyba	Thayer Expedition
20939	1	117	Rio Parahyba	Thayer Expedition
20943	1	91 about	Juiz de Fora	Thayer Expedition
20944	4	70-94	Juiz de Fora	Thayer Expedition
20945	4	89-108	Rio Parahyba	Thayer Expedition
20961 <sup>1</sup>	1	75	Santa Anna	Don Pedro II
21059	2	93, 116	Rio de Janeiro	Thayer Expedition
3366 C. <sup>2</sup>	21	35-118	Rio Doce	Haseman
3367 C.	16	23-46	Rio Doce	Haseman

There is no difficulty whatever in picking out specimens from the Rio Parahyba that agree with Steindachner's definition of *A. jenynsii*. If, however, all the specimens of *Astyanax* from the Parahyba with 25 anal rays and fewer are considered their separation according to the number of anal rays leads to many difficulties. Steindachner gives the following differences between his *A. jenynsii* and his *A. fasciatus* = *taeniatus*.

<i>jenynsii</i>	<i>fasciatus</i> = <i>taeniatus</i>
A. 16-18	19-24
Scales 5-35-4 or 4.5	6-35 or 36-4.5 or 5.5
Depth 3-3.33	2.6-3
Head 3.25-2.75	4
Eye 3.5-4	3-3.66
Interorbital 3	2.75-3

Selecting from among Parahyba specimens all those that in general shape of body and head are like those with the lowest number of anal rays, and all the specimens with fewer than 25 rays, we get:—

Anal rays	17	18	19	20	21	22	23	24
Similar to specimens with 17-19 rays	1	5	4	7	4	3	3	
All specimens with fewer than 25 rays	1	5	4	10	9	8	10	1

<sup>1</sup> A single maxillary tooth on one side, 2 on the other.  
<sup>2</sup> In twelve of these the premaxillary teeth number 3 in the anterior row of each side; in three they number 1 on one side and 3 on the other; in one 1 and 4, and in one 4 and 5. The rest were too small to examine with advantage. The anal rays in eight specimens were  $\frac{19}{2}$ ,  $\frac{20}{2}$ ,  $\frac{21}{3}$ ,  $\frac{22}{1}$ .



There is thus no chance of drawing a line on the score of the anal rays. The scales give a similar series from 33-38. It is, therefore, very probable that part of Steindachner's *A. fasciatus* are his *A. jennynsii* and equal *A. scabripinnis*.

Head 4-4.25; depth in a female 2.66 — 3.26, usually 3 or a little more; D. 11; A. 17-23;<sup>1</sup> scales 6-33 to 38<sup>2</sup>-5; eye equals snout, 3.2-4 in the head; interorbital 2.75-3.2.

Elongate, heavy forward, width of the head at the gill-openings about half the depth at the same place; deepest part of body about halfway between snout and end of anal; no humps or depressions, preventral area rounded, without a complete median series of scales; postventral area narrowly rounded; predorsal area rounded or obscurely scaled, with a nearly complete median series of about ten scales. Occipital process short,  $\frac{1}{2}$  or  $\frac{1}{3}$  of the distance from its base to the dorsal, bordered by three scales; fontanels sometimes of nearly equal width throughout, the anterior only about  $\frac{1}{3}$  as long as the posterior not counting the groove, scarcely reaching forward to above the middle of the eye, at other times tapering forward to beyond middle of the eye, the anterior half as long as the posterior; second suborbital leaving a naked border which is sometimes much wider below than behind, at other times of the same width all around the margin of the bone. Maxillary equals the eye in length; usually three teeth in the front row of the premaxillary, five in the second; of seventeen specimens from Rio de Janeiro two have 1, fourteen have 2, and one has 3 teeth in the maxillary; lower jaw with four or five, rarely more, graduated teeth followed by more or less abruptly smaller teeth.

Scales cycloid, tending to crenate, multistriate, regularly imbricate, no interpolated series above the anal; caudal sheath of scales extending further than usual; anal sheath of a single series of scales; lateral line little decurved, the row of scales below it parallel with it for its entire length; axillary scale large.

Origin of dorsal equidistant from snout and caudal or nearer the latter, its height about  $\frac{1}{3}$  of the length; caudal short, little more than  $\frac{1}{4}$  of the length; anal slightly emarginate, its base about equal to the distance between the dorsals, its origin slightly behind the vertical from the last dorsal ray; ventrals considerably in advance of the vertical from the origin of the dorsal, not reaching the anal; pectorals lack about the width of two scales of reaching the ventrals.

A dark, vertical, humeral spot crossing the second and third scales of the

<sup>1</sup> See table for details.

<sup>2</sup> Of nine specimens from Parahyba one each has 33, 34, 35, and 38 and 38 scales, four have 36; of seventeen specimens from Rio six have 36, nine have 37 and two have 38.

lateral line; a dusky lateral band, extending to the ends of the middle caudal rays, in all but the largest specimen, where it becomes faint. Numerous chromatophores on cheeks and opercle, faint in some, prominent in others; vertical fins dusky or hyaline.

# 58. ASTYANAX SCABRIPINNIS LATICEPS (Cope).

## Plate 47, fig. 5.

*Tetragonopterus laticeps* COPE, Proc. Amer. philos. soc., 1894, **33**, p. 89 (Rio Grande do Sul); FOWLER,

Proc. Acad. nat. sci. Phil., 1906, p. 348.

*Astyanax scabripinnis laticeps* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

*Tetragonopterus fasciatus* EIGENMANN (*non* Cuvier), Ann. N. Y. acad. sci., 1894, **7**, p. 634.

*Astyanax fasciatus* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 19.

HABITAT.—Rio Grande do Sul.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
21853 Paratype <sup>1</sup>	1	58.5	Rio Grande do Sul	
4889 I.	4	45 <sup>2</sup> –125 about <sup>3</sup>	Rio Grande do Sul	Von Ihering
3363 C. <sup>4</sup>	2	68–86	Cachoeira	Haseman
3364 C. <sup>5</sup>	25	38–95	Porto Alegre	Haseman
3365 C.	14	38–65	Cacequy	Haseman

This variety differs from the typical *A. scabripinnis* in the larger number of teeth, there being four in the front row of the premaxillary and more frequently three or even four teeth in the maxillary; four teeth in the lower jaw, with abruptly smaller ones on the sides; the anal ranges from 22–24.

The humeral spot is more concentrated, forming, in part a round or oval spot from which the upward and downward streaks are faint.

In the largest, 125 mm., which is with eggs, the depth is  $2\frac{1}{8}$  in the length.

# 59. ASTYANAX SCABRIPINNIS PARANAE, subsp. nov.

HABITAT.—Southeastern Brazil.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11631 I. Type	1	139	Parana	Von Ihering
11632 I. Paratypes		62–127	Parana	Von Ihering

<sup>1</sup> Collection Academy Natural Sciences Philadelphia.

<sup>2</sup> To base of caudal.

<sup>3</sup> Over all.

<sup>4</sup> A. 22, 23.

<sup>5</sup> A.  $\frac{2.1}{2}$ ,  $\frac{2.2}{2}$ ,  $\frac{2.3}{3}$ ,  $\frac{2.4}{2}$ .

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3402 C. <sup>1</sup>	3	83-95	Rio Grande near Bon Jardim	Haseman
3403 C. <sup>2</sup>	5	59-90 about	Rio Grande near Bon Jardim	Haseman
3404 C. <sup>3</sup>	43	31-105	Burmier	Haseman
3405 C.	3	31-40	Mogy das Cruzes	Haseman
3406 C.	9	32-65	Alto da Serra	Haseman
3407 C.	9	37-53	Mogy Guassu	Haseman
3408 C.	1	49	Rio Paranahyba	Haseman
3409 C.	10	26-68	Bebedouro	Haseman
3410 C.	4	59 <sup>4</sup>	Piracicaba	Haseman
3411 C.	229	129 <sup>4</sup>	Serrinha Parana, Rio Iguassú	Haseman
3412 C.	25	87 <sup>4</sup>	Porto União, Rio Iguassú	Haseman

Head 3.6; depth 2.6 in female, 3.66 in male; D. 11; A. 17-23; scales 6 or 7-36 to 41-5 or 6; eye 5 in the head in the old; interorbital 3.25; snout 3.5; maxillary 3 in the largest female, 4 in the largest male; premaxillary-maxillary border nearly half the length of the head in the largest female, shorter in younger females and in the males.

Heaviest at end of pectorals; preventral area broad, rounded, with irregularly placed scales; postventral area rounded, rather broad; predorsal area broad, completely scaled, but without a distinct median series; about thirteen scales in front of the dorsal.

Occipital process 6 in the distance from its base to the dorsal; interorbital smooth, convex; second suborbital short and deep, its margin very convex, leaving a narrow naked area of about equal width around its entire margin in the female, in the male much less convex, the naked area much wider. Outer series of premaxillary with three to five teeth; inner row with five teeth, the one at the symphysis pointed, the rest 5-pointed incisors. Maxillary with one to seven teeth, the outermost sometimes conical, the innermost 3-pointed. Mandible with four large teeth, two smaller ones and about eight minute ones, all about 5-pointed, the middle point much longer. Scales cycloid, with very many (often twenty or more) diverging striae, regularly imbricate except just over the origin of the anal; the exposed edges of the scales of the sides about half as wide as high; caudal naked; anal sheath of a single series of inconspicuous scales confined to the first nine anal rays; lateral line but little decurved, the row of scales below it parallel with it.

<sup>1</sup> A. 18, 17, 17.

<sup>2</sup> Two with A. 17, three with A. 18.

<sup>3</sup> Anal in four with 17, 17, 18, 19 rays.

<sup>4</sup> Largest specimen.

Origin of dorsal equidistant from tip of snout and last scale at base of middle caudal rays, its penultimate ray half as high as the highest, which is 6 in the length; anal slightly emarginate, its origin behind the vertical from the last dorsal ray, its base just equal to the distance between the dorsals or shorter, 4 in the distance from the pupil to the caudal in the largest female, 6 in the length in the largest male; ventrals little, if any, in advance of the origin of the dorsal, short and rounded, reaching to the anus; pectorals quite small, reaching halfway to middle of ventrals in largest female, a little further in the largest male.

A vertical humeral bar just behind the opercle, a silvery lateral band becoming dark toward the caudal and continued, but much narrower, on the middle caudal rays. The continuation on the caudal sometimes scarcely apparent.

The sexes differ more than in any other species of the genus. The male is much more slender than the female, more cylindrical; the second suborbital is much narrower; the anal basis is much shorter. The maxillary increases with age in the female so that the largest female is quite like *Astyanacinus*. While there are extreme and usual differences there are, however, males with the suborbital as wide as in the female.

#### 60. *ASTYANAX SCABRIPINNIS RIVULARIS* (Lütken).

Plate 46, figs. 1-3.

*Tetragonopterus rivularis* LÜTKEN, Overs. K. Dan. selsk. Forh., 1874, p. 132 (Rio das Velhas and tributaries); LÜTKEN, Vidensk. selsk., 1875, 12, p. 215, pl. 5, fig. 13, 14; ? BOULENGER, Boll. Mus. univ. Torino, 1897, 12 (Mission de San Francisco).

*Astyanax scabripinnis rivularis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

*Astyanax fasciatus* EIGENMANN & OGLE (*non* Cuvier), Proc. U. S. N. M., 1907, 33, p. 19 (Lagoa Santa)

HABITAT.—San Francisco and Parana Basin at Bon Jardin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
	3	73-83	Santo Sera	
20874	3	68-71 <sup>1</sup>	Lagoa Santa	Sceva
20875	9	58-96	Lagoa Santa	Sceva
21032	112	50-85	Bon Jardin	Allen & St. John
21037	1	64	Rio San Francisco	Allen & St. John
21038	2	44, 61	Rio San Francisco	Allen & St. John
21044	75	30-64	Rio San Francisco	Allen & St. John
21047	58	32-59	Rio San Francisco	Allen & St. John
3362 C.	8	82 <sup>2</sup>	Rio das Velhas	Haseman

<sup>1</sup> To base of caudal.

<sup>2</sup> Largest specimen.

Specimens 20874 and some of 20875 seem to be typical *A. rivularis*, the other San Francisco specimens have slightly smaller eyes and a more elongate body; the anal rays in 56 examined are:—five with 20, nineteen with 21, twenty with 22, twelve with 23; the teeth in the inner row of the premaxillary are equally frequently in a row of 4 or 5; in fifteen premaxillaries there are five teeth in outer series, in thirty-three there are 4, in two there are 3.

There is considerable variation in form of specimens from Lagoa Santa, as Lütken has pointed out in the two figures quoted above.

#### 61. *ASTYANAX SCABRIPINNIS LONGIROSTRIS* Steindachner.

*Tetragonopterus fasciatus longirostris* STEINDACHNER, Sitzungsab. K. akad. wiss. Wien, 1907, **96**, p. 481 (Cubataô).

*Astyanax scabripinnis longirostris* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT.—Rio Cubataô, near Theresopolis, Santa Catharina, Brazil.

Head 3.3–3.5; depth 3; A. 18–20; scales 6–35 to 38.4.5 or 5; eye equals snout and interorbital, about 3–3.3 in the head.

Snout bluntly conic, projecting slightly beyond the jaws; maxillary usually with three teeth; depth of caudal peduncle 2.3–2.4 in the head; origin of dorsal over origin of ventrals, equidistant from snout and caudal; pectorals not reaching ventrals; ventrals to anus.

This variety is known from the types only. It is possible that it is *A. obscurus* Hensel.

#### 62. *ASTYANAX SCABRIPINNIS INTERMEDIUS* Eigenmann.

Plate 48, fig. 3.

*Astyanax scabripinnis intermedius* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 98; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Rio Parahyba, Rio Mucari, Rio das Velhas.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20635	2	68, 96	Rio Parahyba	Thayer Expedition
20684	15	44–108	Rio Parahyba	Thayer Expedition
20930	2	86, 113	Rio Parahyba	Thayer Expedition
20939	1	108	Rio Parahyba	Thayer Expedition
20919	42	38–60	Santa Clara, Rio Mucari	Thayer Expedition

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3379 C. <sup>1</sup>	4	32-86	Entre Rios, Rio Parahyba	Haseman
3380 C. <sup>2</sup>	7	33-54	Muniz Freire, Rio Itapemirim	Haseman
3381 C. <sup>3</sup>	6	71-110	Barra de Pirahy, Rio Parahyba	Haseman
3382 C.	2	49	Jacarehy, Rio Parahyba	Haseman
3383 C. <sup>4</sup>	5	75 <sup>5</sup>	Sete Lagoas, Rio das Velhas	Haseman

The true *A. scabripinnis* shades through the specimens mentioned above into *A. taeniatus* Jenyns.

In these specimens we have the elongate form (depth about 3) of *A. scabripinnis*, the eye is larger, being about 2.5-2.75, rarely 3 in the head; the head is slender, pointed; there is a broad naked area on the cheek. The anal ranges from 21 to 24 in the Parahyba specimens, from 23 to 26 in the Santa Clara specimens; the scales range from 37 to 39 in the Parahyba specimens, the Santa Clara specimens have lost them.

Two small specimens of *A. intermedius* and *A. taeniatus* have the following dimensions:—

	20680 <i>intermedius</i>	20635 <i>taeniatus</i>
To base of caudal	47	50
Depth	16	21
Head	12.5	13
Eye	5	5
Interorbital	4	4.5
Scales	6-37-5	6-35-5
Naked part of cheek	1.5	0.75

I think it would be possible to arrange the specimens from the Parahyba, here referred to *A. scabripinnis*, *A. intermedius*, and *A. taeniatus*, into series in respect to any one character and get complete intergradations. There are, however, three forms recognizable. All the deepest specimens show other characters that place them in *A. taeniatus*; all the slender, small-eyed forms are *A. scabripinnis*; and all of the slender, large-eyed forms with widely naked cheeks are *A. intermedius*.

One specimen, 20910, 56 mm. (to base of caudal) Rio Doce, between Linhares and Porto Sousa, probably belongs here.

<sup>1</sup> A. 22, 22, 25.

<sup>2</sup> Some of these could be identified as *A. taeniatus* without straining the imagination.

<sup>3</sup> A.  $\frac{21}{1}$ ,  $\frac{22}{1}$ ,  $\frac{24}{4}$ .

<sup>4</sup> These have the anal rays 25, 22, 23, 24, 23. In all other characteristics they are like some specimens referred to *A. fasciatus*.

<sup>5</sup> Largest specimen.

## 63. ASTYANAX RUBROPICTUS (Berg).

Plate 44, fig. 4.

*Tetragonopterus rubropictus* BERG, Com. Mus. Buenos Aires, 1901, 1, p. 305 (Rio Molinos).*Astyanax rubropictus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Rio Molinos, Argentine, Tenetorio de los Andes.

I have examined one specimen in the British Museum, Caachi Salta, 2500 meters. Scales 6-38-5; A. 19; eye 3.5 (1.2 in interorbital); head 4.33; depth 3.4; four maxillary teeth, tricuspid, the middle cusp but little longer than the others; middle caudal rays not black.

## 64. ASTYANAX MUTATOR Eigenmann.

Plate 53, fig. 2.

*Astyanax mutator* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 18; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434; Mem. Carnegie mus., 1912, 6, p. 353, pl. 51, fig. 3.

HABITAT.—Upper Potaro.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1023 C. Type	1	53	Savannah Landing	Eigenmann
1024 C. Paratypes } 11724 I.	120	23-58	Upper Potaro	Eigenmann

Head 4; depth 2.75-3; D. 11; A. 21-24, most frequently 22; scales 6-33 to 35-4.5; eye 2.75-3; interorbital equals eye.

Compressed, dorsal and ventral profiles equally curved; snout narrow, pointed; profile not depressed over the eye; preventral area rounded, without a distinct median series of scales; postventral area narrowly rounded; predorsal area keeled, with a median series of 9 or 10 scales.

Occipital process very narrow, about  $\frac{1}{5}$  as long as the distance of its base from the dorsal, bordered on each side by three scales; interorbital convex; frontal fontanel much shorter than the parietal; second suborbital narrow, leaving a naked area which is more than half as wide as the bone itself; maxillary equals snout in length, its front margin very convex; premaxillary with two to four teeth in the front series, five 5-pointed teeth in the second series; maxillary with three teeth, of which one is minute; dentary with five or six 5-pointed teeth, graduate; abruptly a series of minute conical teeth on the sides.

Gill-rakers 11 + 18.

Scales regularly imbricate, no interpolated or omitted series; anal sheath

of a single series of scales along anterior part of anal; lateral line little decurved, sometimes broken or interrupted on the tail, each scale with several radiating striae.

Origin of dorsal midway between tip of snout and base of middle caudal rays; highest dorsal ray nearly 4 in the length; origin of anal, and 9th to 11th dorsal ray, equidistant from snout; anal very slightly emarginate; ventrals considerably in front of the vertical from the first dorsal ray, just reaching anal; pectorals just to ventrals or a trifle shorter.

Dusky; a definitely circumscribed oval caudal spot, not continued forward or backwards on the middle caudal rays; a well-defined bar crossing the second and third scales of the lateral line, concentrated into a humeral spot over the lateral line; sides of head and body everywhere profusely dotted; dorsal, caudal, and anal dotted; base of caudal with the outlines of the rays and their cross-breaks outlined in black, making this part of the fin darker.

65. *ASTYANAX GYMNOGENYS* Eigenmann.

Plate 65, fig. 1.

*Astyanax gymnogynys* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 179, pl. 9.

HABITAT.—Rio Iguassú, southeastern Brazil.

Two specimens 3350 C. Type and Paratype. 87 mm. Porto União, Rio Iguassú.

Head 3.8; depth 2.75; D. 11 or 12; A. 21–22; scales 6–41–6; eye 3.2; interorbital equal to the snout, 3.5–3.8 in the length of the head.

Compressed, subrhomboidal; dorsal profile strongly arched, scarcely depressed at the nape; preventral area rounded, with a median series of scales which may become regular in front; postventral area narrowly rounded; predorsal area keeled, with a median series of 13 scales; occipital process one sixth of the distance from the base to the dorsal, bordered by three scales on each side; interorbital but little convex; frontal fontanel long and narrow, but shorter than the parietal; mouth small, the maxillary very broad and long, its length 3.5–4 in the head; second suborbital very narrow, leaving a naked area but one third narrower than the bone; premaxillary with three or four teeth in the front series and five in the second; a single, small concealed tooth on the maxillary. Mandible with three or four larger teeth and two not very abruptly smaller ones, teeth of upper jaw and larger ones of lower jaw trieuspid.

Gill-rakers 8 + 10.

Scales regularly imbricate, no interpolated rows; lateral line little decurved;



caudal naked, anal sheath of a single series of scales along the anterior rays, each scale with several radial striae.

Origin of dorsal nearer to caudal than to tip of snout, its highest ray  $4\frac{1}{2}$  in the length; caudal about  $3\frac{1}{2}$  in the length; origin of anal about equidistant from caudal and base of pectoral; highest anal ray reaching to the base of the penultimate ray or the last but four rays.

Silvery, with brassy luster; a very faint humeral bar; no caudal spot; margin of caudal and middle membranes dusky; anal dusky, the first ray and tips of the next two milk-white.

66. *ASTYANAX AUROCAUDATUS* Eigenmann.

Plate 51, fig. 1.; Plate 69, figs. 6, 8, 10.

*Astyanax aurocaudatus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 26.

HABITAT.—Upper Cauca Basin at western base of Mt. Tolima.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality
5162 C. Type	1	60	{ Boquia
5163a-d C. Paratypes {	9	60 <sup>1</sup>	
12911 I.			

Head 3.5–3.75; depth 2.6–2.75; D. 10; A. 24; scales 7–35 + 2–5; eye 0.8–1 in snout, 3.5–3.8 in head; interorbital 3 in head; depth of caudal peduncle less than half the length of the head; base of anal 3–3.5 in the length.

Deep, compressed, blunt-headed; predorsal area keeled, with about 12 median scales; occipital process narrow, reaching a little more than a sixth of the way to the dorsal, bordered by about three scales; head in the occipital region much arched, the fontanels narrow, the frontal fontanel very short, only about one fourth as long as the parietal without its groove; second suborbital very small, usually narrower than the naked portion of the cheek; cheek very deep; the vertical limb of the preopercle extending downward and backward, the angle acute; lower jaw included, short, but a trifle longer than the eye; maxillary-premaxillary border a simple curve, 2.75 in the length of the head; snout very short and blunt. Premaxillary with five teeth in the outer, wavy line, four teeth in the inner series, the second one being much the heavier; maxillary with several (five or six) teeth of nearly equal size along more than half its margin;

<sup>1</sup> Largest specimen.

mandible with three large, graduated teeth, the middle point of the third one recurved, thorn-like, about seven small, graduated teeth on the side of the jaw.

Gill-rakers of the lower arch reduced to about five minute scarcely evident papillae.

Origin of dorsal about midway between snout and caudal, its base a little less than half the length of the head, its margin obliquely truncate, the highest ray a little more than twice the length of the penultimate. Adipose well developed; caudal lobes a little less than length of head; origin of anal equidistant from snout with the anterior part of the dorsal; ventrals reaching the anal; pectorals beyond the origin of the second third of the ventrals, equal to length of head without the opercle.

Scales regularly imbricate (except over the anterior anal rays?). Caudal naked; anal, in the type at least, with a lobe composed of two rows of scales on the base of the anterior seven rays which are not attached to the rays; lateral line nearly straight.

A large, ill-defined, vertical humeral blotch; no caudal spot; dorsal and pectoral blackish (? in life the whole after part of the body and caudal peduncle golden or orange-red).

These specimens were damaged in transportation, but the third mandibular tooth, the small second suborbital, and color readily distinguish it from the other members of *Astyanax*, from which the species ought probably to be distinguished generically.

67. *ASTYANAX PARANAHYBAE* Eigenmann.

Plate 55, fig. 3.

*Astyanax paranahybae* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 177, pl. 8, fig. 1.

HABITAT.—Rio Paranahyba.

One specimen 3356 C. Type. 54 mm. Rio Paranahyba. August, 1908. Haseman.

Head 4; depth 3.6; D. 10; A. 22; scales 6–38–4 (5 to anal); eye 3 in head, .75 in the interorbital.

Elongate, little compressed or elevated; greatest depth at origin of dorsal; preventral area flattened, with a median series of scales in front; isthmus heart-shaped, *abruptly constricted behind*, a groove at the constriction; postventral area rounded; predorsal area with about 14 scales, in a median series; occipital process very short, about one ninth of the space between its base and the dorsal, bordered by two scales on each side; interorbital flattish, second suborbital little more than half the width of the cheek; snout blunt; maxillary slender,

four in the head, not reaching to below the eye; premaxillary without any antero-posterior extent; three teeth in the outer row of the premaxillary, five in the inner row; maxillary with three or four teeth; mandibular teeth seven, *graduated*; all the teeth tricuspid.

Gill-rakers minute.

Scales regularly imbricate, no interpolated scales; caudal naked, anal sheath along the bases of the anterior rays of a single series of scales; lateral line but slightly decurved; origin of dorsal equidistant from tip of snout and caudal; ventrals not reaching anal, pectorals just to ventrals.

Straw colored in alcohol, a faint silvery band; no caudal spot, a faint humeral spot crossing the fifth scale of the lateral line.

#### 68. *ASTYANAX MULTIDENS* Eigenmann.

Plate 50, fig. 4.

*Astyanax multidens* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 98; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434.

HABITAT.—Amazon.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20840 Cotypes	35	27 <sup>1</sup>	Obidos	James
21064 part Cotype	1	31 <sup>1</sup>	Silva, Lake Saraca	Thayer

One of the smallest species of the genus. Distinguished from all its relatives by the large number (five) of maxillary teeth and the large second suborbital, approaching Hemibrycon.

Head about 3.75; depth 3.33–3.25; D. 11; A. 24–26; scales 5 or 6–32 to 34–4; eye about 2.5 in the head; interorbital about 3.

Slender, deepest under origin of dorsal; preventral area rounded, with a nearly complete series of large, median scales; postventral area narrowly rounded; predorsal area keeled, with a median series of 9 scales.

Occipital process short and broad,  $\frac{1}{3}$  of the distance from its base to the dorsal, bordered by  $2\frac{1}{2}$  scales on the sides; interorbital but very little convex; fontanels very broad at the base of the occipital process, tapering symmetrically to a point above the anterior margin of the pupil, the frontal fontanels as long as the parietal; second suborbital in contact with the preopercle, except sometimes where its margin is rounded in front and behind; maxillary long, but

<sup>1</sup> To base of caudal.

little shorter than the eye; premaxillary with but a short longitudinal extent; mouth large, no notable angle between the borders of the premaxillary and maxillary, the maxillary-premaxillary less than half the length of the head; premaxillary with three teeth in the outer series, five in the inner; five small teeth on the maxillary; dentary with four or five graduated teeth and numerous small ones on the side.

Scales eyeloid, with very few radiating striae, everywhere regularly imbricate, with no interpolated scales or rows of scales; anal sheath composed of a single series of scales along the anterior part of the fin; lateral line nearly straight.

Dorsal about equidistant from tip of snout and base of caudal, its highest ray about 3.5 in head, its penultimate 2.5 in the longest; anal emarginate, its origin about under the end of the dorsal, ventrals a little in advance of the vertical from the dorsal, reaching the anal; pectorals reaching at least to the ventrals.

Straw colored in alcohol, a vertical, humeral spot above the 3d and 4th scales of the lateral line; a narrow silvery band, overlying a black line; caudal with the distal part of its middle rays dark, the black of the caudal separated by an interspace from the black line of the sides; tip of highest dorsal and anal rays sometimes milk-white; fins otherwise without markings.

Vertebrae 12 + 18.

Very probably identical with the above is

One specimen, 20826, 39 mm. (to base of caudal). Obidos. James.

This has four teeth in the outer row of the premaxillary, three in the maxillary; five large teeth in the dentary.

The breast is flat, with a nearly regular series of median scales, the lateral ones distinctly bent. Depth not quite 3.

#### 69. *ASTYANAX GRACILIOR* Eigenmann.

Plate 50, fig. 8.

*Astyanax gracilior* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 98; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434.

HABITAT.—Amazon.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20838 part	1	37 about	Obidos	James
20716	1	63	Villa Bella	Agassiz
21012	1	35 about		Justa

In these the caudal spot is much more prominent, extending to the base of the rays; humeral spot very faint; depth 3.5-4; maxillary teeth three, about 5-pointed; five large dentary teeth; three teeth in the outer row of the premaxillary in 20838 and 21012, five in 20716; pectorals not reaching ventrals; A. 22-24; lateral line 36-37.

70. *ASTYANAX PAUCIDENS* (Ulrey).

Plate 50, fig. 5.

*Tetragonopterus paucidens* ULREY, Ann. N. Y. Acad. sci., 1895, 8, p. 283 (Itaituba).

*Astyanax paucidens* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Amazon.

One specimen, 20978, 29 mm. (to base of caudal). Lago Alexo.

A small species distinguished by the large suborbital, short anal, few scales in the lateral line, absence of humeral spot and diffuse caudal spot.

Head 3.5-3.66; depth 2.75-3; D. 11; A. 20; scales 5-32-3; eye 2.75-3; interorbital 2.6.

Short, dorsal and ventral outlines equally curved; depth of caudal peduncle 2.5 in the greatest depth; predorsal area with 8 median scales, the first pair of scales behind the occipital overlapping.

Occipital process  $\frac{1}{6}$  in the distance from its base to the dorsal; fontanel tapering from the occipital process to above the middle of the eye, the frontal fontanel about half as long as the parietal; second suborbital covering the entire cheek; maxillary slender, equal to the eye in length; two or three teeth in the outer row of the premaxillary, five in the inner; maxillary with two minute teeth; mandible with four large teeth of which the last is retrose and much larger than the following minute teeth of the sides of the lower jaw.

Scales cycloid, with very few, nearly parallel striae, everywhere regularly imbricate; lateral line but little decurved.

Dorsal equidistant from snout and caudal; origin of anal behind the vertical from the last dorsal ray; ventrals not reaching anal, pectorals not quite to anal.

A broad silvery band, no sign of any humeral spot; a round area at middle of base of caudal with chromatophores.

71. *ASTYANAX HASEMANI* Eigenmann.

Plate 92, fig. 2.

*Astyanax hasemani* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 10.

HABITAT.—Rio Grande do Sul.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector		
5476 C. Type	1	55 about	{ Porto Alegre	Haseman		
5477a-e C. Paratypes }	9	25-55				
13170 I.						

This species resembles *A. essequibensis* but differs in the more complete armature of the cheek, in the more decurved lateral line, etc. It forms a perfect bridge between *Astyanax* and some species of *Bryconamericus*. It always resembles the latter genus in the complete armature of the cheek; it usually resembles the former in having five teeth in the inner series of the premaxillary, but in two of the specimens there are but four teeth in this series. These two specimens are typical members of *Bryconamericus* in all but the arrangement of the teeth in the outer premaxillary series which are in a straight line, a condition which is also found in *B. iheringi*.

Head 4.25; depth 3.25-3.33; D. 10; A. 21-24; scales 5-36 to 37-2.5; eye equals postorbital portion of head, 2.5 in head; interorbital 3 in head; depth of caudal peduncle 2 or a little less than 2 in the head.

Compressed, dorsal and ventral profiles equally arched; predorsal area narrow, with about 12 scales in a median row.

Occipital process about  $\frac{1}{3}$  of the distance between its base and the dorsal; interorbital more convex than in *A. essequibensis*; frontal fontanel narrow, triangular, shorter than the parietal; second suborbital leaving a very narrow naked margin behind, in contact with the premaxillary for its entire length below; maxillary long, narrow, maxillary-premaxillary border equal to the full length of the eye; premaxillary with an anterior series of three or four teeth in a straight row; four teeth in the second row in two specimens, five in the others, maxillary usually with four (rarely three or five) minute teeth; mandible with four or five tricuspid, rarely quinquicuspid teeth and about ten abruptly minute conical or tricuspid ones on the side.

Scales everywhere regularly imbricate, no omitted or interpolated scales; scales with up to seven radials, usually not more than two; anal sheath composed of a single row of scales along the base of the anterior rays; a few scales on bases of caudal lobes; axillary scale well developed; lateral line deflected so that a line between its origin and end passes along the upper exposed angles of the series of scales above it.

Origin of dorsal slightly behind the middle; origin of ventrals but slightly in

advance of the vertical from the dorsal; anal but slightly emarginate; pectorals never quite reaching ventrals, sometimes falling short by the width of two scales; ventrals not reaching anal.

Silvery, no distinct markings.

## 72. *ASTYANAX ESSEQUIBENSIS* Eigenmann.

Plate 53, fig. 3.

*Astyanax essequibensis* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 17; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434; Mem. Carnegie mus., 1912, 5, p. 352, pl. 51, fig. 2.

HABITAT.—Essequibo Basin.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1018 C. Type	1	53	Tumatumari, Potaro River	Eigenmann
1019 C. Cotypes } 11721 I. }	96	40–68	Tumatumari, Potaro River	Eigenmann
1020 C. }	1	44	Bartica, Essequibo River	Shideler
1021 C. } 11722 I. }	3	41–48	Rockstone, Essequibo River	Eigenmann
1022 C. } 11723 I. }	75	39–57	Crab Falls, Essequibo River	Eigenmann

Allied to *A. paucidens*; a well-developed humeral spot.

Head about 4; depth 3.33; D. 11; A. 20–22; scales 5–33 to 35–4; eye 2.3; interorbital 3.

Elongate, ventral profile regularly arched; dorsal profile with an angle at the origin of the dorsal, profile not depressed over the eye; preventral area flat, postventral narrowly rounded, predorsal area rounded, with a median series of 8 or 9 scales.

Occipital process about  $\frac{1}{3}$  of the length from its base to the dorsal, bordered by 3 scales; interorbital nearly flat, with marginal grooves; frontal fontanel narrow, longer than the parietal; second suborbital leaving a triangular naked area below its junction with the first; maxillary 3 in the head; premaxillary with two to four teeth in the front series, which is parallel with the second series; five teeth in the second row, their denticles arranged in a distinct crescent; maxillary with three teeth; mandible with four graduated teeth and abruptly smaller ones on the sides.

Scales as in *A. guianensis* but with fewer on the base of the caudal lobe.

Dorsal and ventrals equidistant from tip of snout; highest dorsal ray about

3.75 in the length; origin of dorsal about equidistant from tip of snout and tip of adipose; anal emarginate; ventrals not quite reaching anal; pectorals to ventrals.

Highly iridescent, a few chromatophores on cheek and opercles; an oblique dark band crosses the second, third, and fourth scales of the lateral line, another one parallel to it in front of the dorsal shades into the thickly punctate sides; a punctate band extends from the base of the first dorsal ray to the tip of the seventh and eighth; tip of adipose black; a minute spot at the base of the middle caudal rays, tip of the rays dusky, all of the membranes punctate; a punctate band from the middle of the first anal rays along the tips of the rest of the rays, other parts of the fin hyaline; pectorals and ventrals slightly punctate.

### 73. *ASTYANAX GUIANENSIS* Eigenmann.

Plate 53, fig. 4.

*Astyanax guianensis* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 16; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434; Mem. Carnegie mus., 1912, 5, p. 350, pl. 51, fig. 1.

HABITAT.—Essequibo Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1013 C. Type	1	54	Warraputa, Essequibo River	Eigenmann
1016 C.	1	50	Warraputa, Essequibo River	Eigenmann
11719 I.	1	55	Warraputa, Essequibo River	Eigenmann
1014 C. }	176		Rockstone, Essequibo River	Eigenmann
11717 I. }				
1015 C.	1	45	Crab Falls, Essequibo River	Eigenmann
11718 I.	1	52	Crab Falls, Essequibo River	Eigenmann
1017 C. }	34	43-55	Tumatumari, Lower Potaro River	Eigenmann
11720 I. }				

Allied to *A. multidentis* but without caudal spot.

Head 4; depth 2.6-3; D. 10 or 11; A. 25-27; scales 5-34 or 35 (rarely 36)-4; eye 2.33; interorbital 3.

Compressed, subrhomboidal, ventral profile regularly arched; dorsal profile with an angle at the origin of the dorsal, slightly depressed over the eye; pre-ventral area rounded, tending to flattish, with a median series of scales sometimes irregular in the middle; postventral area narrowly rounded; predorsal area rounded, with a median series of 9 scales.

Occipital process about four times in the distance from its base to the dorsal, bordered by 3 scales on the sides; interorbital flat, with marginal grooves;



frontal fontanel shorter, triangular; second suborbital covering the entire cheek, with the exception of a triangular area below the junction between the first and second suborbital; maxillary much shorter than the eye, 3 in the head; four or five teeth in the first row of the premaxillary, if five the third very slightly out of line with the others; five graduated teeth in the second row, their denticles arranged in a slight crescent; four to seven teeth in the maxillary; mandible with four large teeth, abruptly smaller ones on the sides.

Scales everywhere regularly imbricate, no omitted or interpolated scales; each scale of the side with from 2 to 8 diverging striae; anal sheath of very few scales in a single series along the base of the anterior rays; a few scales on the base of the caudal lobes; a line joining origin and end of lateral line passing through the angles of the scales of the lateral line.

Ventrals slightly nearer snout than the dorsal; origin of the dorsal in advance of the middle, its highest ray 3.25 in the length; anal deeply emarginate, the second and eleventh reaching the base of the eighteenth; ventrals reaching anal, pectorals slightly beyond ventrals.

Opercle dusky, a dark vertical band crossing the 3d to the 6th scales behind the head, a dusky streak below origin of dorsal, sides behind this profusely dotted, margins of scales of the sides of the abdomen with a few color-cells; very few cells on the cheeks; base and tip of dorsal hyaline, the middle with chromatophores; adipose dotted; caudal nearly uniformly dotted, a small area at base of each lobe free from chromatophores; anal lobe and a streak through the middle free from pigment; ventrals and pectorals practically free from pigment.

#### 74. *ASTYANAX GUAPORENSIS* Eigenmann.

Plate 52, fig. 1.

*Astyanax guaporensis* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 176, pl. 7, fig. 4; PEARSON, Indiana univ. studies, 1924, no. 64, p. 41 (Lagoon near Reyes).

HABITAT.—Rio Guaporé, southwestern Brazil.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3351 C. Type	1	49	Rio Guaporé	Haseman
3352 C. Paratypes	2	36–40	Rio Guaporé	Haseman
17322 I.	12	27–44	Lagoon near Reyes	Pearson

Head 3.75; depth 2.75–2.9; D. 11; A. 27, 29, 31; scales 6–35–5; eye 2–2.25 in the head; interorbital 3.

Compressed, ventral area rounded, predorsal area with about 8 scales; occipital process  $\frac{1}{4}$  in the distance from its base to the dorsal; second suborbital leaving but a small triangle below its anterior corner naked, its surface pitted. Three or four teeth in the outer row of the premaxillary, five in the inner; about seven teeth on the maxillary; five large and several minute teeth on each dentary.

Gill-rakers 7 + 12, those of the lower arch large and strong; scales with an interpolated row over the anal, otherwise regularly imbricate.

Origin of dorsal equidistant from snout and tip of adipose or base of ventrals; ventrals reaching anal; pectorals beyond base of ventrals.

A faint humeral band, no caudal markings, a series of black inverted comma-like dashes above a black line along the middle of the body. These markings all faint.

Closely allied to *A. guianensis*.

#### 15. CTENOBRYCON Eigenmann.

κτενός, ό, a comb. Brycon a genus of characins from βρώσκω, to eat greedily. With ctenoid scales.

*Ctenobrycon* EIGENMANN, Bull. M. C. Z., 1908, 41, p. 94.

*Apodastyanax* FOWLER, Proc. Acad. nat. sci. Phil., 1911, p. 422 (*spilurus*).

TYPE.—*Tetragonopterus hauxwellianus* Cope.

The type is distinguished from all other tetragonopterids by its ctenoid scales.

Much compressed; anal long, its margin nearly straight, its origin behind or below the origin of the dorsal; mouth very small, the maxillary not reaching the eye; scales of the breast ctenoid, those of the sides cycloid in young, becoming ctenoid in adult; lateral line complete, a long tube extending on the middle caudal membrane; caudal naked; maxillary with nine to two teeth; a series of tricuspid teeth in the premaxillary and an inner series of 5-pointed ones, whose denticles are arranged in a U-shaped curve. Premaxillary series of teeth in parallel series, the third tooth of the first series not being out of line with the rest. Predorsal area scaled.

HABITAT.—Amazons and northward; Parahyba.

#### Key to the Species.

- a. Depth on an average 2; A. usually 40–46.
  - b. Scales 14 to 12–14 to 51–9 to 11; A. 40–46; maxillary with one tooth.
    - 1. *hauxwellianus* (Cope).
  - bb. Scales 10–11 to 42–9; A. 40–41; maxillary without teeth; second suborbital covering the entire cheek ..... 2. *multiradiatus* (Steindachner).
- aa. Depth on an average 2.5.
  - c. Anal 39 to 47, usually 41 to 45; scales 10 or 12–11 to 50–7 to 10; about 16 scales in a median series in front of the dorsal ..... 3. *spilurus* (Cuvier & Valenciennes).

## 1. CTENOBRYCON HAUXWELLIANUS (Cope).

Plate 32, fig. 2; Plate 98, fig. 7.

*Tetragonopterus hauxwellianus* COPE, Proc. Amer. philos. soc., 1870, **11**, p. 560 (Pebas); Ibid., 1878, **17**, p. 691 (Peruvian Amazon); STEINDACHNER, Flussf. Südamer., 1882, **4**, p. 34 (Hyavary, Santarem); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 274; ? BOULENGER, Boll. Mus. univ. Torino, 1900, **15** (Urucum, Matto Grosso).

*Astyanax hauxwellianus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 340, fig. 28.

*Ctenobrycon hauxwellianus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

*Ctenobrycon rhabdops* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 537 (Igarapé de Candelaria, about two miles from the Madeira River).

HABITAT.—Amazons; Rio Beni Basin, Bolivia; ? Paraguay Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20752	1	95 about	Tabatinga	Bourget
20755	7	45–53 about	Tabatinga	Bourget
20757	4	31–41	Tabatinga	Bourget
20758	1	52 <sup>1</sup>	Tabatinga	Bourget
20765	1	40 <sup>1</sup>	Tabatinga	Bourget
20770	41	95	Tabatinga	Bourget
20795	298	39–72 about	Hyavary	Bourget
20796	2	64	Hyavary	Bourget
20798	4	37–39	Hyavary	Bourget
20800	160	34–49	Hyavary	Bourget
21346	1	54 <sup>1</sup>	Hyavary	Bourget
20814	1	85	Iça	James
20824	1	44 <sup>1</sup>	Rio Trombetas	James
20835	1	48	Obidos	James
20833	1	53	Obidos	James
20837	7	35–38 <sup>1</sup>	Obidos	James
20839	14	32–36	Obidos	James
20836	11	31–56	Obidos	James
20834	1	47 <sup>1</sup>	Obidos	James & Hunnewell
20848	1	46 <sup>1</sup>	Obidos	Bentos
20750	1	33	Obidos	Agassiz
20715	2	60, 64	Villa Bella	Agassiz
20719	4	48, 64	Villa Bella	Agassiz
21000	75	25–45 <sup>1</sup>	Silva, Lake Saraca	Thayer
21066	2	55 about	Silva, Lake Saraca	Thayer
20999	144	28–45	Silva, Lake Saraca	Thayer
20986	1	34 <sup>1</sup>	Serpa	
20989	1	29 <sup>1</sup>	Serpa	
20990	1	32 <sup>1</sup>	Serpa	
20991	6	32–38 <sup>1</sup>	Serpa	
20995	328	27–40 <sup>1</sup>	Serpa	

<sup>1</sup> To base of caudal.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20996	150	36-50	Serpa	
19233	30	33-45	Santarem	Bourget
20787	10	45-67	Santarem	Bourget
803 <sup>1</sup>	2	35, 52	Santarem	Fletcher
20739	1	59	Monte Alégre	Agassiz
21002	3	55-66 about	José Fernandez	Cotinho
3343 C.	16	40-70	San Joaquin	Haseman
3342 C.	3	38-59	Santarem	Haseman
3217 C.	7	43-53	Santarem	Haseman
3218 C.	1	63	Berlin, Rio Mamoré	Haseman
3219 C. <sup>2</sup>	19	35-53	Lagoa de Parnagua, Paranahyba Basin	Haseman
17294	167	25-74	Cachuela Esperanza	Pearson
17295	15	45-60	Reyes	Pearson
17296	9	27-48	Rurrenabaque	Pearson
17297	3	50-68	Lagoons Lake, Rogoagua	Pearson
17298 I.	5	48-52	Huachi	Pearson
17299 I.	2	44, 46	Popoi River, Upper Beni	Pearson
15874 I.	4	63 largest	Rio Ucayali, Contamana	Allen
15875 I.	34	63 largest	Cashiboya	Allen
15876 I.	1	56	Yarinaochoa	Allen
15882 I.	1	65	Mouth of Rio Pacaya, Bretana	Allen
15883 I.	4	38-60	Gosulimacocha, Rio Morona	Allen
15884 I.	10	39-59	Yurimaguas	Allen

Of this species I have been able to examine nearly 1400 specimens from the Amazon between Tabatinga and Monte Alégre. In the Middle and Upper Amazon it must be locally very abundant. As stated above I am in doubt whether the specimens recorded from the Paraguay Basin are not *Astyanax pellegrini* or *alleni* or *Psellogrammus kennedyi*.

<sup>1</sup> Caudal spot faint.

<sup>2</sup> In seven of these the lateral line is complete, in six it may be complete or not, some of the scales are removed and in six it certainly is incomplete as follows. The numbers in italics represent scales with pores.

1. 20 + 2 + 3 + 3 + 1 + 2 + 2 + 5 + ?.
2. 15 + 5 + 5 + 2 + 2 + 3 + 10.
3. 32 + 2 + 1 + 3 + 10.
4. 22 + 1 + 3 + 1 + 4 + 2 + 2 + 1 + 2 + 2 + 6. A. 43.
5. 16 + 2 + 10 + 2 + 3 + 1 + 5.
6. 15 + 1 + 8 + 1 + 1 + 2 + 6 + ?.

These specimens are readily distinguished from *Psellogrammus* by their small caudal spot. There seems to be no shadow of doubt that *Psellogrammus* is derived from *Ctenobrycon*. While the process is complete in the Paraguay and in parts of the San Francisco River the specimens of *Ctenobrycon hauxwellianus* from Parnagua are indifferently *Ctenobrycon* or *Psellogrammus*.

It seems remarkable that the unique character of this species, the serration of the scales of the preventral region in even the young and the serration of the scales of the sides in the adult has not been noted before.

The scales and anal rays are so numerous that variations in these characters do not strike the eye. The anal is, nevertheless, very variable.

Head 3.7-4; depth on an average 2; in a specimen 24 mm. long to base of caudal 2.4, in another 27 mm. long 2.7; in some specimens 40 mm. long 2, in one 71 mm. long (95 mm. in total length) 1.65, and in one 71 mm. long (85 total) 1.9; D. 11; A. usually 40-46<sup>1</sup>; scales 11 to 13-44 to 51<sup>2</sup>-9 to 11; eye on an average 3; interorbital slightly more or less than eye.

Greatly compressed, the dorsal and ventral profiles equally arched but the ventral profile much more regularly so than the dorsal; deepest point of ventral profile at origin of anal; anal basis straight, profile in front of this point curved; profile convex to the bridge of the fontanel as in most of its relatives; from the occipital to the dorsal greatly but evenly arched, there being in the largest specimens a variously developed adipose body beyond the occipital process, descending nearly uniformly from the origin of the dorsal to the caudal peduncle; in the young the profile ascends without much break and the back from above the eyes to the caudal peduncle is symmetrically arched; preventral area narrowly rounded, without a regular median series of scales; postventral area compressed; predorsal area narrowly rounded, scaled, but without a regular median series; 7-12 scales on either side of the occipital process.

Occipital process  $\frac{3}{8}$ - $\frac{4}{10}$  of the distance from its base to the dorsal in the largest specimens,  $\frac{1}{3}$  in the smaller ones; anterior fontanel  $1\frac{1}{2}$  in the length of the posterior, which is continued to the tip of the occipital process as a groove. Interorbital strongly convex; second suborbital large, leaving but a narrow naked strip between it and the vertical limb of the preopercle, in contact with the horizontal; mouth minute, the maxillary very short, convex in front, its upper part nearly vertical when the mouth is closed; less than or equal to the length of the snout,  $4\frac{1}{2}$ -5 in head; mandible  $3$ - $5\frac{1}{2}$  in head in the adult. Four, more rarely five teeth in the front row of the premaxillary, all of them in a series, five teeth in the second series, the cutting denticles of the teeth of the second series arranged in U-form around the outer edge of the tooth; four or five distinctly graduate teeth in the lower jaw, the denticles arranged as in the teeth of the

<sup>1</sup> Of 30, two have 38, one has 39, four have 40, five 41, two 42, four 43, five 44, one has 45, four have 46, one has 48 and one 49. The two largest specimens have the highest rays. Eleven specimens, ten of them taken at random, have a range of from 41-49 anal rays, not much less than all examined.

<sup>2</sup> Of 22 examined one has 44 scales, three have 45, four 46, six 47, three 48, two 49, two 50 and one has 51.

upper jaw but the longest in front instead of behind as in the upper jaw and fitting in between two teeth of the second series of the upper jaw; one broad tooth on the maxillary.

Gill-rakers  $8 + 12$ ,  $\frac{1}{3}$  the diameter of the eye.

Scales small, those of the preventral area denticulate even in the small when those of the sides are cycloid; with age all of the scales become denticulate and very rough; all rows of scales below the lateral line parallel to somewhere above the anal; above the anal there are, as usual, in deep species a number of axillary rows interpolated, the regular series being bent down toward the anal, the bending occurring near the front of the fin for the lower series of scales, near the middle of the anal for the second row below the lateral line; on account of the numerous series of scales this character is well marked; a few diverging striae on each scale; nape and breast closely scaled but no regular median series; lateral line but little decurved, one row of scales below it parallel with it through its entire length; anal sheath of two or three inconspicuous series of scales; caudal naked; a large axillary scale.

Origin of dorsal equidistant from tip of snout and base of caudal or a little nearer the snout; the dorsal high, pointed, its rays rapidly graduate, the last ray being  $\frac{1}{4}$ – $\frac{2}{7}$  the length of the highest, which is  $3$ – $3\frac{1}{2}$  in the length; adipose small; caudal short, its lobes less than the height of the dorsal; anal very low, the anterior highest rays not twice as high as the posterior lowest, its margin straight in the adult, very little emarginate in front in the young, its origin equidistant from tip of snout with the origin of the dorsal; origin of ventrals equidistant from tip of snout and  $3d$  fifth of the anal, their tips reaching to anal; pectorals reaching anal in young, about to middle of ventrals in adult.

A conspicuous silvery lateral band, much narrowed just behind adipose, interrupted above the region of the 4th and 5th scale of the lateral line by the inconspicuous vertical humeral spot; a small, vertically oval black spot on the end of the caudal peduncle and base of middle rays.

Vertebrae  $11 + 24$  in a specimen from Hyavary (20795),  $11 + 21$  in one from Tabatinga (20770),  $11 + 20$  in another.

Air-bladder large, the posterior bent down behind and tapering rapidly to a point; its greatest width longer than the eye or the anterior bladder, about half of the length of the posterior; stomach very small; intestines longer than the entire length.

## 2. CTENOBRYCON MULTIRADIATUS (Steindachner).

*Tetragonopterus multiradiatus* STEINDACHNER, Ichthyol. beitr., 1878, **5**, p. 44 (Teffé); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 273; ? BOULENGER, Boll. Mus. Torino, 1895, **10**, p. 3 (Tucuman); ? Trans. Zoöl. soc. London, 1896, **14**, p. 35 (Descalvados and San Luis).

*Ctenobrycon multifasciatus* (err. typ.) EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

HABITAT.—Amazon and ? Paraguay Basin.

I am inclined to doubt the identification of Paraguay specimens with *C. multiradiatus* Steindachner. They are probably *Astyanax pellegrini* or *A. alleni* or *Psellogrammus kennedyi*.

This species, which I have not seen, seems to differ from *C. haurxwellianus* in the number of scales along the lateral line and in a few other points all of which may be purely individual characters. The largest specimens are about 50 mm. long.

Head 3.6; depth 2; D. 11; A. 40–41; scales 10–41 or 42–9; eye 3; maxillary without teeth; second suborbital covering the entire cheek.

## 3. CTENOBRYCON SPILURUS (Cuvier and Valenciennes).

*Tetragonopterus spilurus* CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, **22**, p. 156 (Surinam); GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 318; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 274.

*Ctenobrycon spilurus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435; EIGENMANN, Mem. Carnegie mus., 1912, **8**, p. 363, pl. 47, fig. 1; MYERS, Fish culturist, 1923, **2**, p. 288 (err. loc.). *Apodastyanax stewardsoni* FOWLER, Proc. Acad. nat. sci. Phil., 1911, p. 423 (Corisal, Venezuela).

HABITAT.—Surinam to Venezuela, along the coast.

The types, two specimens, 50 and 54 mm. long, in the Paris Museum, are in a very poor state of preservation. The scales are now too nearly wanting to count. The caudal spot is very distinct. In color, shape, and anal rays they are very near specimens of *C. haurxwellianus*. Cuvier and Valenciennes state that the anal rays number 48, but Dr. Pellegrin writes me there are 42 and 46, respectively.

Several hundred specimens, the largest 77 mm., from the trenches of Georgetown and the Botanic Garden.

Head 4.25–4.5; depth 2.25–3; D. 11; A. usually 41–45<sup>1</sup>; scales 11 or 12–41 to 50–7 to 10; eye 2.75–3.

About 16 scales in a median series in front of the dorsal. Lateral line nearly straight.

Caudal spot varying greatly in intensity.

<sup>1</sup> Of those examined one has 36, one 39, one 40, three have 41, seven 42, four 43, four 44, three 45, one has 46, and one 47.

Iridescent, bluish above, silvery below; anal with a brick-red streak in front.

An anomalous example without ventrals has been named *Apodastyanax stewardsoni* by Fowler.

#### 16. PSELLOGRAMMUS Eigenmann.

Ψελλος = hesitating, γραμμὴ ἦ = a line. The interrupted lateral line.

*Psellogrammus* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 99.

TYPE.—*Hemigrammus kennedyi* Eigenmann.

Deep, much compressed, small mouthed tetragonopterids with an irregular lateral line and very long anal.

Anal margin nearly straight, its origin below the anterior part of the dorsal or in advance of the origin of the dorsal; mouth very small, the maxillary not reaching the eye; first and second suborbitals covering almost the entire cheek, a very narrow naked margin around their edge; scales of the sides cycloid, with minute teeth in the adult, those of the breast ctenoid as in *Ctenobrycon*; lateral line very variable, developed on but few scales or with interruptions extending to the caudal (complete in two specimens); caudal naked. Maxillary with one or two teeth; premaxillary with an outer series of tricuspid and an inner series of 5-pointed teeth; predorsal area scaled.

In the scales and mouth this genus agrees with *Ctenobrycon*. It differs from that genus in the greater development of its anal and in its irregular lateral line. It also greatly resembles *Astyanax alleni* from which it differs in the same characters and in the ctenoid scales. This genus is probably an offshoot from *Ctenobrycon*. In 1400 specimens of *Ctenobrycon* from the Amazon and several hundred from British Guiana the lateral line is always complete, but in specimens from Lagoa de Parnagua the lateral line is breaking up, that is, typical *Ctenobrycon* is giving rise to *Psellogrammus*.

HABITAT.—Paraguay Basin.

#### PSELLOGRAMMUS KENNEDYI (Eigenmann).

Plate 32, fig. 1.<sup>1</sup>

*Hemigrammus kennedyi* EIGENMANN, Proc. Acad. nat. sci. Phil., 1903, p. 520 (Campo Grande; Arroyo Trementina); Ann. Carnegie mus., 1907, **4**, p. 126 (Corumba; Puerto Max).

*Psellogrammus kennedyi* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 99; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

HABITAT.—Paraguay Basin, rarely in San Francisco Basin.

<sup>1</sup> By mistake the line appears complete.



*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10016 I. Type	1	57	Campo Grande	Anisits
10012 I. } 10019 I. } 10063 I. }	28	36-44 <sup>1</sup>	Campo Grande	Anisits
10184 I.	1	40	Puerto Max	Anisits
10018 I.	1	45	Arroyo Trementina	Anisits
10231 I.	1	42 <sup>1</sup>	Corumba	Anisits
3220 C.	6	40-53	Arequa, Lake Ipacarary	Haseman
3221 C.	1	46	Asuncion	Haseman
3222 C.	12	38-50	Villa Hays	Haseman
3223 C.	4 <sup>2</sup>	45-55	Caceres	Haseman
3224 C.	4 <sup>3</sup>	45-52	Bastos	Haseman
3225 C.	4	45-48	Corumba	Haseman
3226 C.	1	35	Puerto Suarez	Haseman
3227 C.	2 <sup>4</sup>	29-40	Penedo, Rio San Francisco	Haseman
3228 C.	10 <sup>5</sup>	36-51	Barreiras, Lagoa of Rio Grande, San Francisco Basin	Haseman
3337 C.	2	34-38	Corumba	Haseman
3338 C.	1	51	Jaurú	Haseman
3339 C.	32 <sup>6</sup>	31-55	Caceres	Haseman

Head 4-4.33; depth 2.6-2.16; D. 11; A. 40-46; scales 10-40 to 46-8; eye 2.33-2.5, equal to interorbital.

Much compressed, rhomboidal in the older specimens; predorsal area keeled, full sealed, but without a regular median series; preventral area narrowly rounded, with several series of scales, postventral area trenchant.

Occipital process narrow, and long,  $3\frac{1}{2}$  in the distance from its base to the dorsal, curved upward; fontanels elongate oval, the anterior about half as long

<sup>1</sup> To base of caudal.

<sup>2</sup> The lateral line in these four is  $12 + 1 + 2 + 23 + 6$ ;  $21 + 1 + 2 + 5 + 7 + 2 + 8$ ;  $14 + 2 + 2 + 2 + 2 + 3 + 2 + 12 + 7$ ;  $19 + 4 + 4 + 2 + 4 + 2 + 8$ .

<sup>3</sup> One has a complete lateral line, another  $15\frac{1}{2} + 1\frac{1}{2} + 3 + 2 + 4 + 3 + 1 + 4 + 1 + 3 + 2 + 8$ ; another  $16 + 1 + 4 + 1 + 3 + ?$ ; another  $19 + 1 + 8 + ? + 1 + ? + 3 + ? + 1 + 2 + 2$ .

<sup>4</sup> In one  $8 + 31 + 2$ ;  $10 + 31$ .

<sup>5</sup> The lateral line in a number of these specimens is as follows:  $13 + 5 + 2 + 14 + 3 + ?$ ;  $8 + 29 + 2$ ;  $10 + 5 + 1 + 18 + ?$ ;  $19 + 1 + 3 + 2 + 3 + 1 + 2 + 6 + 3$ ;  $9 + 28 + 2 + 2$ ;  $11 + 4 + 1 + 22 + 1$ .

<sup>6</sup> In a number of these the lateral line is:

$13 + 33 + 1$  on the left,  $13 + 35 + 1$  on the right.

$16 + 2 + 1 + 2 + 2 + 1 + 2 + 1 + 2 + 12 + 7$

$22 + 1 + 2 + 3 + 2 + 2 + 2 + 2 + 13$

$14 + 3 + 2 + 2 + 3 + 2 + 2 + 2 + 3 + 3 + 5$

$19 + 2 + 3 + 2 + 3 + 2 + 10$

$29 + 1 + 2 + 2 + 3 + 3 + 5$ .

as the posterior without the groove; cheeks comparatively narrow, with but a narrow naked area; mouth very small, the maxillary nearly vertical, not extending to below the eye; maxillary-premaxillary borders meeting at a right angle, their combined length less than eye; three or four teeth in outer series of the premaxillary, five in the inner series; four large teeth in the dentary followed on the sides by smaller ones, the eight large teeth of the two dentaries in a crescent.

Gill-rakers short.

Scales regularly imbricate with but a few interpolated scales over the muscles of the anal; on the sides with very few diverging striae, their margins smooth in the younger specimens, the margins with fine points in the adult, the scales thin, flexible and the teeth not evident except with a hand lens of high power; scales of the preventral area distinctly serrate; scales of the predorsal area rather small; caudal naked, anal with a sheath of a single series of scales.

Lateral line variously developed  $12 + 30 + 2$ ;  $20 + 1 + 2 + 22$ ;  $26 + 1 + 4 + 7 + 3$ ;  $23 + 3 + 1 + 3 + 1 + 15$ ; in four different specimens in the Indiana University collections, the italicized numbers indicating scales with pores; in another from Corumba they are  $13 + 1 + 2 + 19 + 1 + 3 + 7$  and  $13 + 1 + 3 + 3 + 1 + 1 + 1 + 4 + 1 + 3 + 2 + 3 + 7$  on the two sides. A pore on the middle caudal membrane.

Origin of dorsal equidistant from snout and base of middle caudal rays or nearer the latter; dorsal  $3-3\frac{1}{4}$  in the length; anal slightly emarginate in front, its margin mostly straight, its posterior rays  $2\frac{1}{2}$  in its longest rays; its origin under the origin of the dorsal or nearer the snout; ventrals small, reaching past origin of anal, pectorals to about middle of ventrals.

A faint humeral spot or none, caudal spot roundish, well developed, not extending on the middle rays.

## 17. ASTYANACINUS Eigenmann.

From Astyanax.

*Astyanacinus* EIGENMANN, Amer. nat., 1907, **41**, p. 769.

TYPE.—*Tetragonopterus moorii* Boulenger.

Closely allied to *Astyanax*, from which it differs in the shape of the mouth. The maxillary long, forming, with the premaxillary, about half the length of the head; no distinct angle between the maxillary and the premaxillary. Teeth of the first premaxillary series narrow, 3-pointed, the middle point much the longest; teeth of the second series 5-pointed, the points in nearly straight line, the middle one largest and longest; the large teeth of the two dentaries in a semicircle; four

or five large 5-pointed teeth in the dentary, the middle point much the largest and longest. Lateral line complete, but little deurved; caudal naked.

This genus grades into *Astyanax*.

HABITAT.—Headwaters of the Paraguay Basin.

# 1. *ASTYANACINUS MOORII* (Boulenger).

Plate 2, fig. 6; Plate 61, fig. 2; Plate 64, fig. 6.

*Tetragonopterus moorii* BOULENGER, Ann. mag. nat. hist., 1892, ser. 6, 10, p. 11, pl. 2, fig. 1 (Chapala Plateau); ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 276; BOULENGER, Boll. Mus. univ. Torino, 1897, 12, p. 4 (Caiza); Ibid., 1900, 15, p. 2 (Urucum); FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 432 (near Chapāda, headwaters of the Paraguay).

*Astyanacinus moorii* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 435; PEARSON, Indiana univ. studies, 1924, no. 64, p. 41 (Rio Beni Basin at Tumupasa; Popoi River, Upper Beni; Ixiamas; Huachi; Rurrenabaque).

HABITAT.—Upper Paraguay Basin to the Basin of the Rio Beni, Bolivia.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
— <sup>1</sup>	2	75	Chapala Plateau	Moore
21826 <sup>2</sup>	1	106	Chapāda, Rio Paraguay	Smith
17180 I.	19	55-76	Tumupasa	Pearson
17181 I.	24	54-95	Popoi River, Upper Beni	Pearson
17182 I.	5	52-78	Ixiamas	Pearson
17183 I.	13	45-70	Huachi	Pearson
17184 I.	3	54-100	Rurrenabaque	Pearson

Head 4; depth 3½; D. 11; A. 31; scales 8-34-6; eye 3.5; interorbital 2.8.

Heaviest shortly behind pectorals, tapering gradually to the caudal, abruptly to the snout; preventral area rounded, with irregularly placed scales; postventral region narrow, compressed; predorsal area keeled, with a nearly complete series of about 13 scales.

Occipital process slender, 4 in the distance from its base to the dorsal; interorbital smooth, convex; the frontal fontanel about as long as the parietal without the occipital groove; second suborbital short and deep, leaving a narrow naked border around its entire margin; maxillary very long, 2.75 in the head; maxillary with the snout more than half the length of the head, equal to the mandible. Outer series of premaxillary with four teeth, of which the third is withdrawn from the line; five teeth in the second row. Maxillary with four to six teeth; mandible with four large teeth and numerous smaller ones.

<sup>1</sup> Types. Collection British Museum.

<sup>2</sup> Collection Academy Natural Sciences Philadelphia.

Scales cycloid, with numerous nearly parallel striae, regularly imbricate on the sides except over and just in front of the anal where there are interpolated rows; the exposed edges of the scales about two thirds as wide as high; caudal naked, anal with a sheath of a single inconspicuous series of scales; lateral line but little decurved, the row of scales below it parallel with it.

Dorsal more than an orbital diameter nearer the snout than to the caudal, its penultimate ray  $2\frac{1}{4}$  in its highest ray which is  $4\frac{1}{2}$  in the length; anal long, emarginate, its origin under the last dorsal ray, its base not quite equal to the distance between the dorsal and the tip of the adipose, 3 in the distance from the anterior margin of the eye to the caudal; ventrals a little in advance of the origin of the dorsal, reaching the anal; pectorals just reaching the ventrals.

A large horizontally oval, well-defined humeral spot on the upper part of the 2d to the 5th scale of the lateral line and the 2 scales above them; a dark lateral band toward the caudal and continued to the end of the middle rays.

## 2. *ASTYANACINUS MULTIDENS* PEARSON.

Plate 59, fig. 4.

*Astyanacinus multidens* PEARSON, Indiana univ. studies, 1924, no. 64, p. 41, pl. 9, fig. 4.

HABITAT.—Upper Paraguay Basin to the Basin of the Rio Beni, Bolivia.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
17323 I. Cotypes	22	95-140	Rio Colorado, Lower Bopi	Pearson
17324 I.	2	64, 96	Popoi River, Upper Beni	Pearson
17325 I.	1	76	Tumupasa	Pearson
17326 I.	1	83	Rurrenabaque	Pearson

Head 3.66 to 4; depth 3 to 3.33; D. 11; A. 28 to 31; eye 3.5 to 4.25.

Lateral line 7 or 8-39 to 41-7; three or four teeth in the outer series of the premaxillary, five in the inner row; mandible with four large teeth in front and then followed abruptly by smaller teeth on the sides; maxillary with about eleven teeth along almost the entire border; maxillary-premaxillary border  $\frac{1}{2}$  the length of the head; the third suborbital with a wide naked border; about twelve gill-rakers on the lower gill-arch, their length equal to one half the diameter of the eye; interorbital convex; predorsal area narrowly rounded; 15 scales between the occipital process and the origin of the dorsal; dorsal truncate, the highest ray .85 the length of the head, its origin much nearer the tip of the snout than to the base of the caudal, separated from the adipose by 6 or 7 scales when depressed;

preventral area rounded; the pectorals usually not quite reaching the base of the ventrals; ventrals almost reaching anal, occasionally reaching the anal; anal emarginate; scales of the lower caudal lobe adherent, no pouch in the males.

An oval spot just above the lateral line, covering scales 3 to 5; caudal spot large, extending to the end of the middle caudal rays; a wide, rather indistinct, lateral band; chromatophores collected into spots at the bases of the caudal scales.

### 18. DEUTERODON Eigenmann.

*δευτερόδω*, to repeat, *ὀδών*, *ὀ*, a tooth. In allusion to the similarity of the teeth on the lower jaw.

*Deuterodon* EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 140.

*Joinvillea* STEINDACHNER, Anz. K. akad. wiss. Wien, 1908, no. 5, p. 2.

TYPE.—*Deuterodon iguape* Eigenmann.

Compressed, elliptical fishes of small size <sup>1</sup> most nearly related to *Astyanax*, from which they differ in dentition. Teeth all multicuspid incisors, those in the premaxillary in two series, those in the maxillary (2-7) and in the mandible in a single series, the latter graduate; lateral line complete; caudal naked. The typical species is largely phytophagous.

It is quite certain that this genus is of composite origin. One element has arisen in southeastern Brazil, another including *D. nasutus*, in Nicaragua.

HABITAT.—Nicaragua, Guiana, and southeastern Brazil.

#### *Key to the Species.*

- a. Free margin of the maxillary little if any longer than the horizontal extent of the premaxillary.
  - b. Innominate bones protruding as spines; A. 23-26. Scales 7-35-5.
    1. *acanthogaster* Eigenmann.
  - bb. Innominate bones weak, concealed.
    - c. A series of black dots surrounding the pores of the lateral line. Scales 6-37 to 40-4; A. 24 to 25; 4-5 maxillary teeth.
      2. *polaroensis* Eigenmann.
    - cc. A pinnate lateral band. Scales 6-36 or 37-4 or 5; A. 24-27; 3-4 maxillary teeth.
      3. *pinnatus* Eigenmann.
    - ccc. A silvery lateral band and well-defined humeral and caudal spots.
      - d. Scales 7 or 8-36 or 37-6 or 7; anal 25 or 28; head subconical; teeth not tipped with brown; eye less than interorbital, equals 3.4-3.75 in head; 4-6 maxillary teeth along more than half of the maxillary.
        4. *nasutus* (Meek).
      - dd. Free portion of the maxillary equals the horizontal extent of the premaxillary; eye equal to or a little longer than snout, 3.3 in head, less than interorbital; 2 to 7 maxillary teeth. Scales 6-34 to 37-5; A. 20-24.
        5. *iguape* Eigenmann.
    - aa. Free portion of the maxillary much longer than the horizontal extent of the premaxillary; eye much longer than snout, 2.6-2.75 in head.
      - e. Second suborbital leaving a wide naked area; head 4-4.33.
        6. *pedri* Eigenmann.
      - ee. Second suborbital leaving a very narrow naked area; head 3.5-4.
        7. *paralybae* Eigenmann.

<sup>1</sup> The greatest recorded length is about 13 cm. over all.

1. *DEUTERODON ACANTHOGASTER* Eigenmann.

Plate 55, fig. 1.

*Deuterodon acanthogaster* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 179.

HABITAT.—Upper Paraguay Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3395 C. Type	1	54	Corumba	Haseman
3395 bis C. Paratypes	12	44–55	Corumba	Haseman
3396 Paratypes	6	35–52	Rio Jaurũ	Haseman

Head 4; depth about 2.3; D. 11; A. 23–26; scales 7–35–5; eye 2.5; interorbital about equal to the eye.

Deep, compressed; innominate bones very strong, diverging forward, the ends protruding as spines, (as in *Astyanax mucronatus*), the space between them concave; no regular median series of scales in front of the ventrals; predorsal line with about 10 scales; occipital process about 5 in the distance from its base to the dorsal; interorbital convex, the frontal fontanel  $1\frac{1}{2}$  in the parietal; snout short, blunt; second suborbital leaving but a narrow naked margin; maxillary shorter than the snout; premaxillary with five broad, nine or more pointed incisors in the second row, two much smaller 5-pointed teeth in the front row; maxillary with two teeth similar to those of the second series; dentary with eight graduated teeth.

Gill-rakers 6 + 9.

Scales regularly imbricate except over the origin of the anal where there is sometimes an interpolated scale; caudal naked; anal sheath very imperfect, of a few scales at the base of the anterior rays.

Origin of the dorsal nearer snout than to caudal, its highest ray 3 in the length; anal long, emarginate; ventrals reaching anus or anal, pectoral reaching ventrals.

A faint humeral bar, a silvery lateral band, a well-defined oval caudal spot continued on the bases of the middle caudal rays.

2. *DEUTERODON POTAROENSIS* Eigenmann.

Plate 56, fig. 4.

*Deuterodon potaroensis* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 27; Rept. Princeton univ. exped. Patagonia 1910, 3, p. 431; Mem. Carnegie mus., 1912, 5, p. 363, pl. 53, fig. 1.

HABITAT.—Lower Potaro River, British Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1053 C. Type	1	43	Amatuk Cataract, Potaro River	Eigenmann
1054 C. Paratypes } 11744 I. Paratypes }	5	39-50	Amatuk Cataract, Potaro River	Eigenmann
1055 C. } 11745 I. }	3	31-35	Waratuk Cataract, Potaro River	Eigenmann

Head 3.8-4; depth 3.2-3.5; D. 9 or 10; A. 24 or 25 (rarely 27); scales 6-37 to 40-4; eye 2.5; interorbital equals eye.

Elongate, little compressed, heavy at shoulder; dorsal and ventral profiles equally arched, without hump or depressions; preventral area compressed to a narrow edge; predorsal area keeled, with a median series of about 13 scales.

Occipital process about  $\frac{1}{2}$  of the distance from its base to the dorsal, bordered by 3 scales; head narrow, smooth above, slightly convex; frontal fontanel much shorter than the parietal, narrow; second suborbital leaving a naked area about  $\frac{1}{3}$  as wide as its own greatest width; maxillary longer than snout but not quite equal to eye; premaxillary with three 3-pointed teeth in the front row and five 3- to 5-pointed ones in the second. Denticles of the second row in a more or less open crescent; four or five maxillary teeth similar to those of the inner row of the premaxillary. Mandible with seven graduated, multicuspid incisors, followed by one or two conical ones.

Gill-rakers 6 + 12.

Scales regularly imbricate, without interpolated or omitted rows; each scale with numerous nearly parallel striae; anal sheath of a few scales in a single row along the base of the anterior rays. Caudal naked; lateral line but little decurved; a well-developed axillary scale.

Origin of dorsal a little nearer snout than caudal, its penultimate ray a little more than half as long as the longest ray which is about  $\frac{1}{4}$  of the length. Margin of anal straight, the rays graduate from the anterior longer ones; ventrals very short not reaching anal, a little nearer to the snout than the dorsal; pectorals reaching ventrals.

In formalin specimens each pore of the lateral line is surrounded by black, the dots forming a conspicuous line; bases of two rows of scales below the lateral line over the abdomen and three or four rows of scales above the lateral line dark, the spots forming fainter longitudinal lines; margins of scales of the upper parts of the sides and the entire dorsal line very dark; a faint comma-shaped vertical

humeral spot interrupted in the middle; a dark lateral band intensified in spots and ending in a caudal spot which extends from a little above the lateral line to the lower margin of the caudal; vertical fins dusky.

### 3. *DEUTERODON PINNATUS* Eigenmann.

Plate 56, fig. 3.

*Deuterodon pinnatus* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 25; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 431; Mem. Carnegie mus., 1912, 5, p. 365, pl. 53, fig. 2.

HABITAT.—Essequibo Basin. Possibly in the Upper Potaro.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1046 C. Type	1	62	Amatuk, Potaro River	Eigenmann
1047 C. Paratypes } 11738 I. Paratypes }	25	32-75	Amatuk, Potaro River	Eigenmann
1048 C. Paratype	1	36	Konawaruk, Essequibo River	Eigenmann
11739 I. Paratype	1	40	Konawaruk, Essequibo River	Eigenmann
1049 C. Paratypes } 11740 I. Paratypes }	19	21-43	Warraputa Cataract	Eigenmann

Distinguished from all other tetragonopterids except the young of *Astyanax orthodus* by the pinnate black markings of the sides.

Head 4-4.3; depth 2.5-2.7; D. 10 or 11; A. 24-25 rarely 27; scales 6-36 or 37-4 or 5.

Compressed, subrhomboidal, profile slightly depressed over the eye; pre-ventral area rounded, the scales large, a nearly regular median series; postventral area narrowly rounded, the anus directly in front of the anal; predorsal area narrowly rounded, with a median series of about 9 scales.

Occipital process triangular, not quite one fourth of the distance from its base to the dorsal, bordered by 3 scales; interorbital convex; fontanels narrow, the anterior shorter than the parietal; second suborbital deep, leaving a wide naked area; maxillary about 3.5 in the head; three or four teeth in the outer row of the premaxillary; five graduated teeth in the inner series, expanded at top, the denticles in a crescent, the middle denticle not notably larger or longer than the others; three or four similar teeth in the maxillary; dentary with eight to ten graduated teeth, similar to those of the premaxillary but with longer median point; all the teeth brown tipped.

Gill-rakers short, 6 + 10.

Scales regularly imbricate, no omitted or interpolated series; lateral line



nearly straight; axillary scale small; anal sheath of a few scales in a single series along the base of the anterior rays. Caudal naked.

Ventrals in advance of the vertical from the dorsal; origin of dorsal in the middle or slightly in advance of the middle, its highest ray 3.75 in the length; 12th anal ray  $\frac{2}{3}$  to about  $\frac{1}{2}$  as high as the highest, the anal margin concave or not; pectorals reaching slightly beyond origin of ventrals, ventrals not quite to anal.

Cheeks and opercles punctate; a well-developed humeral spot in a vertical humeral band, a second band in front of the dorsal shading into the much punctate sides; a black median line from which branch black streaks along the muscle-septa at every other myotome; a conspicuous, large caudal spot not continued to the end of the middle rays. Dorsal, adipose, caudal, and anal punctate, the latter sometimes most so along the base and tip.

Alimentary canal with both animal and plant debris.

There are also

1050 C. 11741 I. Forty-one specimens 21–68 mm. Amatuk; 1051 C. 11742 I. Seven specimens 20–69 mm. Waratuk; 1052 C. 11743 I. Three specimens 23–40 mm. Savannah Landing. Eigenmann.

These differ from the typical ones described in that the color along the sides is in a dark band instead of pinnately distributed, continued to the caudal spot which is continued to the end of the middle caudal rays. A. 23–25; lateral line 37, 37, 38, 38, 39, 40 in the 6 largest from Amatuk.

It is difficult to determine with certainty whether the minute specimens from Savannah Landing belong to this species.

#### 4. DEUTERODON NASUTUS (Meek).

Plate 66, fig. 8.

*Astyanax nasutus* MEEK, Field mus. Publication, 1907, no. 121, p. 108 (Managua, Cislaya); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 431.

Three specimens, 5909 Field Museum. Types, about 104 mm. Managua. Meek.

HABITAT.—Nicaragua.

Head 3.4–3.6; depth 2.66–2.75; D. 11; A. 25–28; scales 7 or 8–36 or 37–6 or 7; eye 3.4–3.75, equals snout; interorbital 3.3–3.75.

Elongate, not greatly compressed; dorsal and ventral profiles equally curved, a slight depression in the profile over the eyes; ventral surfaces rounded, the postventral narrower than the preventral surfaces; predorsal surface very bluntly keeled, with about 10 scales in the lateral line, not forming a regular series.

Occipital process  $\frac{1}{5}$  of the distance from its base to the dorsal; interorbital broad, little convex; frontal fontanel a little more than half the parietal without the groove; head subconical, the snout narrow and long; suborbitals leaving a very broad naked area .4 as wide as the bone at its widest; free margin of the maxillary greater than the antero-posterior length of the premaxillary; gape not extending beyond the anterior nares; maxillary-premaxillary length 2.75 in the head; maxillary with 4-6 teeth, along more than half of its length, the toothless portion strongly convex, the teeth when there are six, crowded, in part transverse; three or four 3-pointed teeth in the front row of the premaxillary; five 5-7 pointed graduate teeth in the inner series; lower jaw with nine 5-pointed teeth on each side, heavy, their outer surface convex, graduate regularly from the large first tooth to the very small ninth; the teeth are all heavier, less distinctly incisor-like than in *D. iguape* and not brown tipped.

Gill-rakers 8 + 14, short.

Scales cycloid, with numerous subparallel striae, regularly imbricate except for a few interpolated rows above the anal; anterior part of anal with a sheath of a single series of scales; lateral line but little decurved; a well-developed axillary scale.

Dorsal a little nearer the snout than to the caudal, its height 4.5 in the length, nearly an orbital diameter more remote from the snout than the ventrals; anal under last ray of dorsal, slightly emarginate; ventrals not reaching anal, pectorals to within one scale of or quite to ventrals.

A dark (silvery in life) lateral band from upper part of gill-opening to caudal, a diffuse humeral spot over the second and third scales of the lateral line; a rather large caudal spot continued to the end of the middle rays.

Vertebrae 14 + 20.

Alimentary canal about equal to the entire length. Stomach filled with plants.

##### 5. *DEUTERODON IGUAPE* Eigenmann.

Plate 65, fig. 2; Plate 95, fig. 7.

*Tetragonopterus fasciatus* EIGENMANN & NORRIS (*non* Cuvier), Revista Mus. Paulista, 1900, 4, p. 357 (Iguapé).

*Deuterodon iguape* EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 140, pl. 41, fig. 3 (Iguapé); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 431.

*Astyanax depressirostris* RIBEIRO, Kosmos, 1908, 1 (Rio Ribeira).

*Joinvillea rosae* STEINDACHNER, Anz. K. akad. wiss. Wien, 1908, no. 5, p. 2 (Joinville); 1909, no. 12, p. 197.

HABITAT.—Coastwise streams of São Paulo, Parana, and Santa Catharina.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
9265 I. Type	1	90	Iguapé	Von Ihering
11636 I.	3	104-113	Raiz da Serra	Von Ihering
3400 C.	2	78, 81	Rio Mogy, Raiz da Serra	Haseman
3401 C.	45	37-91	Raiz da Serra	Haseman
3399 C.	1	62	Iguapé	Haseman
3398 C.	5	45-89	Cubãto	Haseman
3397 C.	30	48-102	Morretes	Haseman
—	2	54, 92	Iporanga	Krone

Very similar to *Astyanax fasciatus*.

Head 3.75; depth 2.6; D. 11; A. 20-24; scales 6-34 to 39-5; eye equal to or a little longer than snout, 3.33 in the head, less than interorbital in the adult, greater than interorbital in the young.

Compressed, elliptical, dorsal and ventral profiles nearly equally arched in front of the dorsal and ventrals; preventral region rounded; predorsal area bluntly keeled, with about 11 scales forming a nearly complete median series.

Occipital process 5.5 times in the distance from its base to the dorsal, bordered by 2 scales on the side; head somewhat pointed, convex above; frontal fontanel less than half the length of the posterior without the occipital groove; preorbital leaving a naked area equal to  $\frac{1}{4}$  of its width; snout variable, rather long, equal to the eye, the mouth nearly horizontal, little oblique, terminal, the gape extending to below the posterior nostrils, 3.5 in the head; maxillary short,  $\frac{2}{3}$  as long as eye, slender, reaching at least to below front margin of pupil; maxillary-premaxillary 2.5 in the head; appearance of mouth differing much with the variation of the number of teeth in the maxillary, the mouth longer in those with a larger number of teeth in the maxillary.

Two to seven many-pointed teeth on the upper part of the maxillary; premaxillary with two series of teeth, two on each side on the outer series of the type, placed opposite the space between the first and second and second and third teeth of the second series, expanded at the tip, each with a long median and two small graduated lateral cusps; three teeth on each side of 11636; five slightly graduated teeth in the inner series, compressed 7-pointed incisors; teeth of the lower jaw similar to those of the upper, more pointed, ten on each side, graduated.

Gill-rakers slender, about 12 on the lower arch.

Scales cycloid, their free margins with numerous non-converging, subparallel lines; anterior anal rays with a sheath composed of a single series of scales;

lateral line complete, little decurved, the row of scales below it parallel with it; scales regularly imbricate, no interpolated scales over the anal.

Fins medium; origin of dorsal slightly behind ventrals, equidistant from or a little nearer tip of snout than base of middle caudal rays, its height less than length of head; margin slightly concave; origin of anal considerably behind the vertical from the last dorsal ray; ventrals not reaching anal; pectorals not to ventrals.

In alcohol, straw-color; a silvery lateral band overlying a dark band; a well-marked variable humeral spot, sometimes smaller than eye; a well-defined oval spot on caudal peduncle continued to the end of the middle rays and forward on the sides; no other marks on the fins; dorsal and anal profusely dotted.

Alimentary canal about  $1\frac{1}{3}$  times as long as the entire fish. Stomach filled with succulent plants neatly sheared into bits.

#### 6. DEUTERODON PEDRI Eigenmann.

*Deuterodon pedri* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 98; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 431.

HABITAT.—Southeastern Brazil.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
21081 Cotypes	7	73-100	Rio San Antonio, Santa Anna de Ferros	Thayer Exped.
20956-20960 <sup>1</sup>	153	41 <sup>2</sup>	Santa Cruz	Don Pedro II

The types are in very poor condition. They are undoubtedly a species of *Deuterodon* distinct from *D. iguape*.

Head 4-4.33; depth about 3; D. 10 or 11; A. 22-27; scales 7-36-6; eye 2.6-2.75 in head; snout 4-4.5; interorbital 2.75-3.

A little more slender than *D. iguape*; free margin of the maxillary nearly twice as long as the antero-posterior length of the premaxillary; maxillary-premaxillary border one half the length of the head without opercle; cheeks with a rather wide naked area; three or four teeth in the outer series of the premaxillary, five in the second, the denticles of the second row of teeth in a slight crescent; maxillary with two or three teeth; dentary with about ten teeth graduated from the minute lateral tooth to the large first tooth; teeth all more or less tipped with brown.

<sup>1</sup> The specimens should in all probability be referred to *D. pedri*, but on account of the poor condition of the types an absolute identification is impossible. The dentary teeth are characteristic, but the antero-posterior extent of the premaxillary is *nil* in the smallest specimens.

<sup>2</sup> Largest to base of caudal.

Dorsal and ventrals about equidistant from snout.

A humeral spot, a silvery lateral band and a large caudal spot continued apparently to the end of the middle rays.

#### 7. DEUTERODON PARAHYBAE Eigenmann.

*Deuterodon parahybae* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 99; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 431.

HABITAT.—Rio Itapemerim.

Eight specimens 20933 Cotypes. 46–53 mm. Rio Itapemerim. Hartt and Copeland.

Head 3.5–4; depth 2.5–3; D. 11; anal 24–26, most frequently 25; scales 6–34?–5; eye 2.66–2.75 in the head, a little greater than interorbital; snout 4 in the head.

Compressed elliptical; dorsal and ventral profiles equally arched; caudal peduncle as high as long; head compressed, deep at the occiput, the snout rounded; frontal fontanel  $1\frac{1}{2}$  in the parietal, occipital process  $\frac{1}{7}$  of the distance of its base from the dorsal; second suborbital leaving a very narrow naked margin; free margin of the maxillary 1.5 times the horizontal length of the premaxillary; two or three tricuspid teeth in the first series of the premaxillary; five graduate 5–7-pointed teeth in the second series; maxillary with two teeth; dentary with seven to nine graduated teeth, of which the last may be retrorse conical.

Gill-rakers 7 + 12.

Dorsal nearly equidistant from the snout and base of middle caudal rays; ventrals a little in advance of the vertical from the dorsal. Caudal lobes longer than head; anal much emarginate, the highest ray reaching about to base of last but 5 rays.

Scales mostly removed, cycloid, with several slightly diverging striae.

A well-defined, vertical humeral spot; a large caudal spot, the middle caudal rays black.

#### 19. LANDONIA Eigenmann and Henn.

For Hugh McKennan Landon, patron of two expeditions to South America.

*Landonia* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 19, p. 1.

TYPE.—*Landonia latidens* Eigenmann.

Allied to *Astyanax*. Maxillary with two very broad straight-edged teeth, their cutting edge continuous, and more than half the length of the maxillary; premaxillary teeth in two rows very closely pressed together, two or three teeth

in the outer row, alternating with the four of the inner row, all these teeth incisor-like notched, the entire series of premaxillary teeth about as wide as the first of the maxillary teeth; mandible with five or six teeth on each side, the posterior three similar to but narrower than those of the maxillary, the anterior two narrower and finely denticulated, the cutting edges of the teeth continuous; second suborbital long, leaving a narrow naked margin; lateral line complete; caudal naked; gill-rakers 17 + 8, slender, half as long as eye, those of the upper arch similar to those of the lower.

This genus should probably be placed with the *Corynopominae*. It has the modified caudal scales of the *Corynopominae*, the position of the dorsal of the *Tetragonopterinae*.

1. *LANDONIA LATIDENS* Eigenmann and Henn.

Plate 84, figs. 2, 3; Plate 86, figs. 1-5; Plate 97, fig. 7.

*Landonia latidens* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 19, p. 2; EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 152.

HABITAT.—Southwestern Ecuador.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5408 C. Type	1	55	Vinces, Ecuador	Henn
5409 C. } 13100 I. }	14	59	Vinces, Ecuador	Henn
5493 C. } 13101 }				
	22	28-52	Colimes, Rio Daule, Ecuador	Henn

Head 4; depth 3.3-4; D. 11; A. 31-32; scales 8 or 9-45 to 50-5 or 6; eye 2.5 in head, greater than interorbital.

Compressed, clupeoid; ventral regions rounded, predorsal area rounded with a median naked line; parietal fontanel longer and considerably wider than the frontal; skull smooth; lower jaw very oblique, its tip entering the profile; mouth small, maxillary shorter than eye; dermal border of opercle wide; teeth as in generic description.

Dorsal pointed, its origin in middle of length, reaching about halfway to caudal, about equal to length of head; adipose well developed; caudal equilobed, the lobes about equal to length of head; anal falcate, its origin under end of dorsal, its lobe about equal to length of head less opercle, in males with several tubercles on the 2d, 3d, and 4th rays on a large retrorse hook on the 5th to the

9th; ventrals small, considerably in advance of the vertical from the origin of the dorsal, in the female falcate not reaching anal, in the male truncate, the outer and inner rays prolonged, reaching the anal; pectorals narrow, reaching to or beyond origin of ventrals.

Scales regularly arranged, few or no radials; caudal naked; a few scales along the bases of the anterior anal rays in the male forming a lobe free from the rays reaching to the enlarged hooks of the 5th-9th rays; lateral line sagging in front of the dorsal. Male with a glandular ridge along the middle caudal rays and a pouch formed by an upper dermal lobe with free lower margin and a lower dermal lobe with a free upper margin just below the middle ones. Last scale of the lateral line widened and lobed. A conspicuous black spot on the basal two fifths of the middle caudal rays, upper caudal lobe margined with dark; tip of dorsal dusky; no humeral spot; a narrow silvery band.

## 20. NEMATOBRYCON Eigenmann.

*νημα, τό*, a thread, Brycon, a genus of characins, from *vorákw* to eat greedily.

*Nematobrycon* EIGENMANN, Ann. mag. nat. hist., 1911, ser. 8, **10**, p. 215.

TYPE.—*Nematobrycon palmeri* Eigenmann.

Caudal of male three-pronged, the middle two rays nearly as long as or even longer than the outer rays which are prolonged filiform. Lateral line incomplete; no adipose fin; premaxillary teeth multicuspid, in two series; maxillary with large conical teeth along nearly its entire length; caudal naked.

HABITAT.—Atrato and San Juan Basins, Colombia.

### *Key to the species.*

- a.* Lateral band abruptly bordered by light above the anal. A. 29-31; highest dorsal ray in male about 2 in the length; outer and middle caudal rays in the male about 2 in the length.
  - 1. *palmeri* Eigenmann.
- aa.* Lateral band not bordered by light above. A. 32-36; highest dorsal ray in the male about 3.5-4 in the length, outer and middle caudal rays of the male about 3.5 the length.
  - 2. *amphiloxus* Eigenmann & Wilson.

## 1. NEMATOBRYCON PALMERI Eigenmann.

Plate 60, figs. 3, 4; Plate 97, figs. 8, 10, 11.

*Nematobrycon palmeri* EIGENMANN, Ann. mag. nat. hist., 1911, ser. 8, **10**, p. 215; Mem. Carnegie mus., 1922, **9**, p. 154.

HABITAT.—San Juan Basin, Pacific slope of Colombia.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
—— Brit. Mus.	20	7.5–20	Condoto, Rio Condoto	Palmer
—— Brit. Mus.	6	7–13½	Novita, Rio Tamana	Palmer
5350 C. }	69	39 <sup>1</sup>	Condoto	Wilson
13026 I. }				

Head 4.2; depth 2.66; D. 10–11; A. 29–31; scales 7–7 to 26–5; eye 3 in the head, .5–.75 in the snout, about equal to the interorbital.

Compressed, resembling *Crenuchus* and *Poecilocharax* in general appearance and in the absence of an adipose; dorsal and ventral profiles nearly equally arched; highest point of dorsal profile at origin of dorsal, ventral profile regularly arched; predorsal area with a median series of about 7 scales; preventral area narrowly rounded; occipital process with 3 scales on each side, about one fifth as long as the distance from its base to the dorsal; frontal fontanel minute; interorbital moderately convex; second suborbital heavy, convex, in contact with the preopercle below; mouth oblique, jaws equal; maxillary equal to snout and one third or one half the eye; premaxillary with three teeth in the outer series, four in the inner, about eleven teeth on the maxillary; mandible with four large teeth in front and minute ones on the side.

Scales regularly arranged, no interpolated scales over the anal; a basal sheath of scales on the anal and caudal; these fins otherwise naked; few or no radial striae.

Origin of the dorsal about equidistant from snout and middle caudal rays; highest dorsal ray about half the length; outer and middle caudal rays in the adult male produced in filaments about half the length of the body; anal long, its origin equidistant from the base of the middle caudal rays and the middle or end of the eye; slightly emarginate in front; ventrals reaching beyond origin of the anal, pectorals to or beyond the origin of the anal.

In formalin a broad black band from the eye down and to the lower half of the caudal, margined above with a light line and fading out downward; in life (?) upper surface coppery; dorsal filament, outer caudal filament, middle caudal rays and filament and submarginal anal band black; margin of anal hyaline. The dark lateral band most intense in Novita specimens.

<sup>1</sup> Largest specimen.



## 2. NEMATOBRYCON AMPHILOXUS Eigenmann and Wilson.

Plate 60, figs. 1, 2.

*Nematobrycon amphiloxus* EIGENMANN & WILSON, Indiana univ. studies, 1914, no. 19, p. 13; EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 154.

*Nematobrycon palmeri* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 3 (*non* Ann. mag. nat. hist., 1911).

HABITAT.—Head waters of San Juan River and of the Atrato River on the opposite sides of the continental divide.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5050 C. Type	39	14-26	Boca de Raspadura	Eigenmann
12819 I. Paratypes				
5353 C. Paratypes	54	42 <sup>1</sup>	Tambo, Atlantic side	Wilson
13027 I. Paratypes				
5351 C. Paratype	1		Managru, Atlantic side	Wilson
13028 I. Paratype	1		Istmina, Pacific side	Wilson
5352 C. Paratypes	20	44 <sup>1</sup>	Raspadura, Atlantic side	Wilson
13029 I. Paratypes				

Very similar to *N. palmeri*, more robust, dorsal lower, caudal filaments shorter, and less falcate, dark band not bordered by a light line above.

Head 4 (3.66); depth 2.5 (2.66-2.75); D. 10; A. 32-36; scales 6 or 7-6 to 28-5; eye 2.5 in head, greater than interorbital.

Highest dorsal ray 3.5-4 in the length; outer and middle caudal rays about 3.5 in the length. Band of the sides broad, fading out toward the upper part of the sides in front, more abruptly lighter above the anal but without a distinct light line along its border.

The specimens 5050 C., 12819 I. were in the absence of actual specimens of *N. palmeri* referred to that species. Mr. Wilson collected a large series both of *N. palmeri* and of this species. They are quite distinct, *N. amphiloxus* being found both in the Atlantic and in the Pacific drainage.

## 21. MICROGENYS Eigenmann.

μικρός, small, γένυς, ή, cheek.

*Microgenys* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 22.

TYPE.—*Microgenys minutus* Eigenmann.

<sup>1</sup> Largest specimen.

Allied to *Creagrutus* and *Bryconamericus*, having the anal like the former and the teeth like the latter.

HABITAT.—Upper Cauca in Colombia and Balsas in Peru.

*Key to the Species.*

- a. Depth 4; A. 10; 4 teeth in the outer series of premaxillary teeth; origin of the dorsal equidistant from the tip of the snout and the base of middle caudal rays.....1. *minutus* Eigenmann.  
 aa. Depth 3.25–3.35; A. 13; 3 teeth in the outer row of premaxillary teeth; origin of the dorsal nearer tip of snout than to base of middle caudal rays.....2. *lativirgatus* Pearson.

1. *MICROGENYS MINUTUS* Eigenmann.

Plate 35, fig. 2.

*Microgenys minutus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 22; Mem. Carnegie Mus., 1922, 9, p. 147.

HABITAT.—Upper Cauca.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5007 C. Type	1	45	Rio Viera at Piedra Moler	Eigenmann
5008 C. Paratype	1		Rio Viera at Piedra Moler	Eigenmann
12788 I. Paratype	1		Rio Viera at Piedra Moler	Eigenmann

Head 4–4.33; depth 4; D. 10; A. 10; scales 4–35 (about)–2.5; eye .7 in snout, 3 in head, 1 in interorbital; depth of caudal peduncle a little more than 2 in the length of the head, 2.4 in its own length.

General appearance of *Creagrutus brevipinnis* from the same locality, but a little more slender; predorsal area rounded, with about 11 median scales; ventral surface broad, rounded; occipital process very short, about one seventh of the distance from its base to the dorsal; skull smooth, rounded, frontal fontanel about half as long as the parietal; snout very blunt, rounded, the jaws equal, the lower slightly projecting when the mouth is open; second suborbital about three fourths as wide as eye, in contact with the lower limb of the preopercle; mouth very small, maxillary-premaxillary border only about three fourths as long as eye; four teeth in the outer row of the premaxillary, the first and third slightly withdrawn from the rest, four teeth in the inner series; the two median ones of the two premaxillaries unusually close together; three small teeth on the maxillary; five to seven graduated (?) teeth on the mandible. Teeth brown tipped, each with a large triangular median cusp and a very minute lateral cusp near the base on each side.

Gill-rakers 5 + 9.

Origin of dorsal almost exactly equidistant from tip of snout and base of middle caudal rays; margin of dorsal truncate, nearly coterminous; distance between dorsal and adipose four and one half in the length; caudal forked, the lobes more than four in the length; anal short, slightly emarginate, its highest rays not reaching tip of the last, its origin under end of the dorsal; ventrals short, about two thirds the length of the head, their origin in advance of the vertical from the origin of the dorsal, not reaching anal; pectorals shorter than the head, not reaching the ventrals; scales thin, deep, caudal naked; about 3 scales of the sides forming a basal sheath for the anterior part of the anal.

A median silvery band.

## 2. MICROGENYS LATIVIRGATUS Pearson, sp. nov.

Four specimens 17642 I. Cotypes. 56–71 mm. Rio Pusoc, above Balsas, Peru. Pearson.

HABITAT.—Rio Pusoc, Peru.

Head 4.25; depth 3.25–3.35; D. 10; A. 13; scales 4.5–40 to 42–2.5, lateral line complete; eye 3.3 in the head, interorbital equal to the eye.

Fontanel narrow, beginning above the posterior quarter of the eye and extending to the base of the occipital process; occipital process slightly less than one half of the diameter of the eye; second suborbital scarcely in contact with the preopercle below, leaving a naked area behind; mouth small; length of the maxillary bone eight tenths of the eye-diameter; scarcely reaching to below the anterior margin of the eye; teeth tricuspid or conical, when tricuspid the lateral cusps blunt and frequently indistinct; three or four tricuspid teeth on the maxillary; three conical teeth in the outer series of the premaxillary, the second tooth withdrawn, sometimes to the extent of being in line with the second series, in which case there are four teeth in the second series; the second series with the last tooth out of line, the symphysial pair in contact; the mandible with three graduated tricuspid teeth followed by two or three smaller graduated teeth.

Gill-rakers short, three tenths of the eye diameter, 6 + 8; preventral area rounded.

Origin of the dorsal one half the head length nearer the tip of the snout than to the base of the caudal; its margin truncate; caudal forked, the lobes 4.6 in the length; anal slightly emarginate, its origin slightly posterior to the last dorsal ray; ventrals not reaching anal, their origin below the second dorsal ray; pectorals not near reaching ventrals.

An oval humeral spot; a broad median lateral band ending at the base of the caudal in a dark area of equal width.

## 22. CERATOBANCHIA Eigenmann.

κέρας, τό, a horn, βράγκιον, τό, gill. In allusion to the antler-like gill-rakers of the type.

*Ceratobranchia* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 3.

TYPE.—*Ceratobranchia obtusirostris* Eigenmann.

A tetragonopterid in which the outer series of teeth of the premaxillary has become the dominant one.

Lateral line complete, caudal with scales on its basal third; adipose fin well developed; origin of dorsal near middle of body; a second suborbital in contact with the preopercle below; premaxillary with two parallel series of teeth, four teeth in each series, outer series more prominent. Teeth of lower jaw graduate.

HABITAT.—South central Peru.

### 1. CERATOBANCHIA OBTUSIROSTRIS Eigenmann.

Plate 88, figs. 2, 3.

*Ceratobranchia obtusirostris* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 4.

One specimen 13154 I. Type. 65 mm. Chanchamayo, east of Tarma, Peru. Rosenberg.

HABITAT.—Chanchamayo, Peru.

Head 4.66; depth 4.66; D. 10; A. 16; scales about 4-35-2; eye 3.33 in head, equals interorbital or opercle, longer than snout.

Elongate, dorsal and ventral profiles very little arched, profile well rounded, the mouth horizontal, terminal; occipital only about  $\frac{1}{3}$  in the distance to the dorsal; skull almost convex; no parietal fontanel; occipital fontanel narrow, about two thirds as long as eye; second suborbital considerably narrower than eye, leaving a naked area behind it; maxillary about 2.66 as long as eye, its first tooth forming a series with the outer series of the premaxillary; premaxillary with an outer series of four teeth of about equal size, each with three graduate lateral cusps and a disproportionately large median cusp; three very similar teeth along the upper half of the maxillary, the first one as large as the maxillary teeth, the last about one third as large. Teeth of the inner row of the premaxillary very similar to those of the outer, but smaller and the median tooth asymmetric. Mandibular ramus with nine graduated teeth, very similar to those of the outer series of the premaxillary, the median cusp much larger.

Gill-rakers about  $7 + 11$ , those near the angle three-pronged or with lateral horns.

Dorsal rounded, the longest ray equal to head less snout; adipose fin well developed; caudal lobes about equal to the length of the head; origin of anal and last dorsal ray equidistant from snout; last anal ray considerably in advance of the vertical from the adipose; origin of ventrals more than an orbital diameter in front of the dorsal, just reaching the anal; pectorals reaching ventrals.

Scales large, thin, with numerous nearly parallel striae, regularly imbricate; lateral line nearly straight; anal with a sheath formed of a single series of scales; basal portion of caudal scaled.

A large vertical humeral spot crossing the third and fourth scales of the lateral line; a dusky lateral band extending on middle caudal rays.

Easily distinguished by its mouth, teeth, gill-rakers, and shape.

## 2. CERATOBANCHIA BINGHAMI, sp. nov.

Plate 96, fig. 1.

HABITAT.—Rio Urubamba Basin.

### *Specimens examined.*

Catalogue number		Number of specimens	Size in mm.	Locality	Collector
31561	Type	1	53	Santa Ana, Rio Urubamba	Heller
7058a-c	C. }	22	53 <sup>1</sup>	Santa Ana, Rio Urubamba	Heller
13758a-g	I. }				
—		1	—	Rio Comerciato	Heller
7057a-b	C.	3	45-57	Rio Comerciato	Heller
16049	I.	—	64 <sup>1</sup>	Santa Ana	Eigenmann

This species is possibly synonymous with *C. obtusirostris*, of which only the type, 65 mm. long, is known. As the largest specimen of the present species is only 53 mm. in length the differences may be due to age. It is also possible that the type of *C. obtusirostris* is aberrant. The differences in the teeth would indicate that the two species are distinct.

Head 4.66-5; depth 3.8-4.66; D. 10; A. 16/10,<sup>2</sup> 17/1, 18/1; scales 4 or 4.5-38 to 40-3.5; eye 3.33 in head, equal to interorbital.

Fourteen scales between occipital and dorsal. Premaxillary with 4/2,<sup>1</sup> 5/16, 6/2 teeth in a regular outer row, four smaller teeth in the inner row; maxillary with 2/13,<sup>2</sup> 3/4; mandible with six teeth; usually two cusps on each side of the median one of the premaxillary teeth, rarely three.

<sup>1</sup> Largest specimen.

<sup>2</sup> Number of specimens having the given number of anal rays and premaxillary and maxillary teeth.

Gill-rakers not pronged, simple, about 5 + 10.

A diffuse humeral spot; a silvery lateral band; middle caudal rays a little more thickly peppered than the rest.

For Hiram Bingham, Director of the Yale Geographical Expedition.

### 23. BRYCONAMERICUS Eigenmann.

Brycon, a genus of American characins.

*Bryconamericus* EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 139.

TYPE.—*Bryconamericus exodon* Eigenmann.

Since the key to the Tetragonopterinae was published (p. 50–53) the genera *Argopleura* and *Phenacobrycon* have been separated from *Bryconamericus*. They resemble *Bryconamericus* in most characters, but differ in the presence of a squamous pouch on the basal caudal rays of the males. They follow directly after *Bryconamericus*.

Very similar to *Astyanax*, *Mimagoniates*, *Hemibrycon*, and *Piabina*. Lateral line complete; caudal naked; second suborbital expanded, in contact with the lower limb of the preopercle, not leaving a naked triangle below the suture between the first and second suborbitals, except rarely in *B. peruanus*, which approaches *Astyanax breviceps*.

Two rows of teeth in the premaxillary; none to six teeth in the maxillary; a single row in the mandible. For the rest the teeth are very variable. There are uniformly four teeth in the inner series of the premaxillary, their tubercles are either in a straight line or in a curve; the mandibular teeth are graduated in *B. microcephalus*, *B. eigenmanni*, and *B. boops*, the lower jaw broad and weak; in others the jaw is narrow, heavy, and there are three to five heavy teeth in front, graduated outward from the symphyseal tooth, or, the lateral one heaviest and a series of minute teeth along the side of the lower jaw, not directly continuous with the front teeth. The front row of the premaxillary varies most. In the type, *B. exodon*, the symphyseal tooth and the lateral tooth project far out beyond the rest, the second to the third may be arranged in a curve or the third may be a little in advance of the other two. At the other extreme stand *B. peruanus*, *B. iheringii*, and *B. eigenmanni* in which the outer row of teeth may be in a line or one or two may be slightly withdrawn from the line.

There are three or four recognizable groups in the genus *Bryconamericus* and these may have been independently derived from different species of *Astyanax* and *Hemibrycon*. One of the groups with *B. peruanus* as a nucleus has evidently been derived from a species like *Astyanax brevirostris*, unless the latter is a rever-

sion. It is found along the Cordilleras from Peru to Costa Rica. Its species range from 52–132 mm. in length.

Another group, of which *B. exodon* is the nucleus, is derivable from the long slender species of *Astyanax* like *A. paucidens* or from *Piabina*. Its members are found in the Amazon Basin, in Rio Grande do Sul and in the La Plata Basin,<sup>1</sup> and reach a maximum length of 84 mm.

HABITAT.—La Plata Basin, north along the coast to Rio Grande do Sul; along the Paraguay to the Amazon and Guiana and to Bolivia, western Peru to Costa Rica. Richest in species along the slopes of the Cordilleras of northern Ecuador and Colombia.

### Key to the Species.

- a. Four or five (rarely 6) scales between the origin of the dorsal and the lateral line. Depth 3.33–4.5.  
 A. 16–25 (except in *B. phoenicopterus*, *B. alburnus*, *B. astictus*, 5 or 6 in *B. microcephalus*). Maxillary with none to four teeth. (East of the Cordilleras, chiefly in Amazon, Rio Grande do Sul, and La Plata).
- b. A. 16–26. (See also *B. iheringii*, *B. eigenmanni*, and *B. cismontanus*).
- c. Tips of caudal lobes not black.
- d. Ventral and dorsal profiles nearly equally curved, the snout more or less pointed, the mouth terminal.
  - e. A. 17 or 18; head 4.33; depth 3.66; D. 10, rarely 9; scales 4–35 to 38–3; eye 3 in head, equals interorbital; maxillary with three or four teeth; two, rarely three, teeth in the outer row of the premaxillary.....1. *deuteronoides* Eigenmann.
  - ee. A. 15 or 16; head 4–4.3; depth 4.2–4.7; D. 10; scales 4–34 to 37–2.5; eye 2.8–3; three or four tricuspid teeth in outer series of the premaxillary.....2. *hemigrammus* Pearson.
  - eee. A. 15 or 16; head 4–4.3; depth 4.5–5; D. 10; scales 4–35 to 38–2.5–3; eye 3–3.3; three or four teeth in outer series of the outer teeth of the premaxillary....3. *bolivianus* Pearson.
  - eeee. A. 16 or 17; head 4.5; depth 4; D. 9; scales 4–36–2; eye 2.66–2.75 in head, equals interorbital; maxillary with three or four teeth; four to six teeth in the outer row of the premaxillary.....4. *hyphessus* Eigenmann.
  - eeeee. A. 16–18; head 4.3; depth 3.75; scales 5–40–43; eye 3.5; maxillary with four teeth.  
 5. *grosvenori* Eigenmann.
  - eeeeee. A. 16; head 4–4.33; depth 3.5–3.7; D. 10; scales 5 or 6–40 or 41–4; eye 3; maxillary with five or six teeth.....6. *microcephalus* (Ribeiro).
  - eeeeeee. A. 20; head 4; depth 3.33; D. 10; scales 4.5–37–3; eye 2.5; maxillary with two teeth.  
 7. *diaphanus* (Cope).
  - eeeeeeeee. A. 18–20; head 4; depth 3.2–3.6; D. 10; scales 4–36–3; eye 2.4 in the head; maxillary with two or three teeth.....8. *norae* Eigenmann & Henn.
  - eeeeeeeeee. A. 22; head 4.5–4.75; depth 4.25–4.5; eye 2.75–3 in head, equals interorbital; maxillary with one or two teeth; D. 10; scales 5–38–3; caudal with few or many chromatophores along the middle rays; dentary teeth on the sides abruptly smaller than the anterior ones.  
 9. *stramineus* Eigenmann.
  - dd. Ventral profile nearly straight; anterior dorsal profile very strongly arched, the snout very blunt; mouth small; the maxillary less than the eye; head 4; depth 3.6; D. 10; A. 22; scales 5–38–4; eye 2.6; maxillary with four teeth; middle caudal rays dusky  
 10. *boops* Eigenmann.
  - cc. Tips of caudal lobes black; head 4.33–4.4; depth 3.66–4; A. 23–25; teeth of the outer row of the premaxillary in a zig-zag.....11. *exodon* Eigenmann.
  - bb. Anal with 26–29 rays.
    - f. Head 4.2; depth 3.3; D. 10; A. 26–29; scales 5–36–3.5; eye 2.5 in head; maxillary reaching to end of first suborbital, with three teeth; a roundish, caudal spot continued to the end of the middle rays.....12. *phoenicopterus* (Cope).

<sup>1</sup> I am not sure that *B. astictus* and *B. alburnus* placed in this group belong to Bryconamericus.

- ff.* Head 4.8; depth 3.53; D. 10; A. 27; scales 5-37-3; eye about 2.3; interorbital 2.5; maxillary without teeth, reaching to below middle of eye; pectorals reaching ventrals; ventrals reaching nearly to anal; origin of dorsal midway between ventrals and anal; base of anal greater than distance from base of last dorsal ray to tip of adipose; a vertical humeral spot; a silvery lateral band; no caudal spot or band.  
13. *alburnus* (Hensel).
- fff.* Head 3.5; depth 3.5; D. 10; A. 30; scales 5-35-3.5; eye 2.5 in head, equals interorbital; maxillary without teeth; no caudal or humeral spot; a silvery lateral band.  
14. *astictus* (Ulrey).
- aa.* Five or six scales between the lateral line and the origin of the dorsal. Depth 2.6-3.2; (3.66 in *B. pachocuti*); maxillary with two to five teeth; A. 16-23 (La Plata Basin, eastern Brazil, and eastern slope of Andes).
- g.* A. 16; scales 5-37-4; depth 3; five or six teeth in the outer series of the premaxillary, the second and fourth withdrawn from the rest. . . . . 15. *cismontanus* Eigenmann.
- gg.* A. 21-23; scales 6-37 to 41-5; four to six teeth in the outer series of the premaxillary; depth 3.25-3.66. . . . . 16. *pachocuti* Eigenmann.
- ggg.* A. 18-23; scales 5 or 6-35 to 38-3.5; head slender; maxillary two thirds the length of the eye; premaxillary with an outer, more or less regular, series of three to five teeth; ventral and dorsal outlines much arched; depth 2.6-3; caudal longer than head; pectorals not reaching ventrals; depth of caudal peduncle about  $\frac{1}{3}$  of the greatest depth. . . . . 17. *iheringii* (Boulenger).
- gggg.* A. 18-21; scales 5 or 6-38 to 39-3.5 or 4; maxillary three fourths as long as eye; ventral and dorsal outlines but little arched; depth 2-3.2; caudal equal to length of head; pectoral reaching to ventrals; depth of caudal peduncle little less than half the depth. . . . . 18. *eigenmanni* (Evermann & Kendall).
- aaa.* Six to nine scales between the lateral line and dorsal; depth 2.5-3.5; A. 25 to 33, sometimes 23 in *alpha.* (Pacific slope of Peru, Ecuador, on both slopes of Colombia and Central America).
- h.* Maxillary with two to four teeth, confined to the upper anterior margin.
- i.* Origin of dorsal about equidistant from tip of snout and base of middle caudal rays or nearer the latter. (Peru to Panama).
- j.* Middle caudal rays pale, no caudal spot; scales 6 or 7-36 to 40-7; A. 26-30; head 4.4; depth 3.4; pectorals reaching to or nearly to ventrals, ventrals to or nearly to anal; origin of dorsal equidistant from base of middle caudal rays and from snout or an orbital diameter nearer the latter. Two teeth on the maxillary; interorbital much larger than eye. . . 19. *simus* (Boulenger).
- jj.* A conspicuous black spot on caudal peduncle, not continued to the end of the rays.
- k.* Scales 40-48, 8 between dorsal and 11; head 3.8-4; maxillary four fifths eye; two teeth on maxillary; caudal spot somewhat continued on central caudal rays. . . . . 20. *cascajalensis* Meek & Hildebrand.
- kk.* Scales 8-10 to 49-6 or 7; head 3.6 to 4; maxillary equal to length of eye; eye equal to or larger than interorbital.  
21. *emperador* (Eigenmann & Ogle).
- kkk.* Scales 6-38-5; head 3.66; maxillary three fourths as long as eye; eye greater than interorbital; three teeth on the maxillary; caudal spot without a definite colorless area anterior to it below.  
22. *ortholepis* Eigenmann.
- kkkk.* Scales 6 (or 7)-39 or 40-5 or 6; head 4-4.6; maxillary three fourths as long as eye; eye equals interorbital or not quite equal to it, 2.4-2.7 in head; males with tubercles on head, fins and scales; caudal spot well defined, sometimes extending in part on the middle caudal rays; area anterior to it below without chromatophores. . . . . 23. *scopiferus* Eigenmann.
- kkkkk.* Scales 6-38-6; head 4.25; maxillary five sixths as long as eye; eye  $1\frac{1}{7}$  to  $1\frac{1}{3}$  in interorbital, 3-3.33 in the head; caudal spot not sharply defined, no chromatophores in the area anterior to it below.  
24. *scopiferus guaitarae* Eigenmann.
- jjj.* Middle caudal rays black.
- l.* D. 10 rarely 9.
- m.* Eye 3-3.5 in the head, 1.1-1.25 in the interorbital; depth 2.9-3.25; head 4-4.5; maxillary equals eye; A. 25-28; scales 6-37 to 40-5 or 6. . . . . 25. *caucanus* Eigenmann.



- mm.* Eye 2.66 in the head, 1 in interorbital; head 4; maxillary much shorter than eye; A. 23-26, rarely 27; scales 6 or 7-39 or 40-4 or 5; a broad band; anal hyaline at base, shading to a dark margin.  
26. *alpha* Eigenmann.
- mmm.* Eye 2.8-3; 1 or 1+ in interorbital; head 4-4.25; maxillary shorter than eye; A. 25-32, usually 27-30; scales 5 or 6-36 to 39-3 or 4, usually 37 or 38, a sharp black line on side; anal without dark border.  
27. *beta* Eigenmann.
- ll.* Dorsal 11.  
*n.* A. 27-32; lateral line 36 or 37; eye 3.1-3.5 in the head (2.75 in the young), 1.2-1.4 in the interorbital; depth 2.5-2.8 (3.25).  
28. *perannus* (Müller & Troschel).  
*nn.* A. 36-43; lateral line 43-50; eye 2.5-3, about equal to the interorbital; maxillary 1.5 in the eye; depth 2.75-3.28.  
29. *brevirostris* (Günther).
- ii.* Origin of dorsal an orbital diameter nearer the snout than the base of the middle caudal rays. (Costa Rica and (?) south Ecuador).  
*o.* Eye equals the interorbital; A. 28-31; scales 7-39 to 40-6.  
30. *ricae* Eigenmann.  
*oo.* Eye 1.3-1.5 in the very convex interorbital; A. 28-29; scales 7-37 to 39-6. .... 31. *scleroparius* Regan.
- hh.* Maxillary with four to six teeth; origin of dorsal about equidistant from snout and caudal; middle caudal rays black; D. 10, rarely 9; eye 9.3 in the head; depth about 3.4; anal A. 28-31; lateral line over 50. .... 32. *alfredae* Eigenmann.<sup>1</sup>

## 1. BRYCONAMERICUS DEUTERODONOIDES Eigenmann.

Plate 91, fig. 3.

*Bryconamericus deuterodonoides* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 5; Mem. Carnegie mus., 1922, 9, p. 236.

HABITAT.— Eastern slope of the Andes, east of Bogota.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5461 C. Type	1	43	Rio Negro, Quebrada at Villavicencio	Gonzales
5463 C. Paratypes } 13150 I.	13	48 <sup>2</sup>	Rio Negro, Quebrada at Villavicencio	Gonzales

Allied to *B. hypheusus*. Dentition in both species very similar to that of *B. deuterodon*.

Head 4.33; depth 3.66; D. usually 10, rarely 9; A. 17 or 18; scales 4 (rarely 5)-35 to 38-3 to ventrals; eye longer than snout, about equal to interorbital, about 3 in head.

Slender, compressed, dorsal and ventral profiles equally arched; preventral area rounded, without a distinct median series of scales; predorsal area rounded with a median series of 12 scales; occipital process a nearly equilateral process

<sup>1</sup> See also *Hemibrycon* of which genus this species may be the young.

<sup>2</sup> Largest specimen.

about one ninth the distance from its base to the dorsal, bordered on the sides by 1 or 2 scales; frontal fontanel triangular, not half as long as parietal; snout blunt, lower jaw included, maxillary-premaxillary border a regular curve, maxillary a little longer than premaxillary, about .75 of eye; cheek entirely covered by the suborbital which is somewhat pitted; maxillary usually with three, rarely with four, graduated 7-9 pointed teeth, occupying more than half the length of the margin; premaxillary usually with two, rarely with three narrow 3-5-pointed teeth, opposite the spaces between the first and second and second and third teeth of the inner series; four teeth similar to those of the maxillary, but the line joining their tips more arched and the largest point nearer the outer than the inner margin; each ramus of the lower jaw with seven to nine regularly graduated teeth, overlapping and slightly asymmetric on the side of the jaw.

Gill-rakers about 4 + 7, minute, the tip of one not reaching the base of the next.

Scales large, thin, with very few striae, regularly imbricate, without interpolated scales; caudal lobes with a few scales; a series of scales in part along the base of the anal, in part on the sides; lateral line complete, decurved.

Origin of dorsal midway between tip of snout and caudal; highest dorsal ray about one sixth the length; adipose fin behind the vertical from the base of the last anal ray; caudal lobes equal to the head; origin of anal in front of vertical from last dorsal ray; ventrals very short, not reaching anal, their origin a little in advance of the origin of the dorsal; pectorals not reaching ventrals by two or more scales.

A faint vertical humeral spot crossing the 5th and 6th scales of the lateral line; a silvery lateral band, sometimes ending in a caudal spot extending in part on the caudal; fins all hyaline.

This species differs from the species of *Deuterodon* in the complete armature of the cheeks, the presence of but four teeth in the inner series of the premaxillary. It differs in the nature of its outer premaxillary teeth from the typical *Bryconamericus*.

## 2. *BRYCONAMERICUS HEMIGRAMMUS* Pearson.

*Bryconamericus hemigrammus* PEARSON, Indiana univ. studies, 1924, no. 64, p. 44 (Popoi River).

HABITAT.—Upper Beni Basin.

Eleven specimens 17353 1 Cotypes. 25-40 mm. Popoi River, Upper Beni. Pearson.

Head 4 to 4.3; depth, 4.2 to 4.7; D. 10; A. 15 or 16; eye 2.8 to 3; scales 4-34 to 37-2.5; interorbital equal to the eye.

Second suborbital in contact with the preopercle below, leaving a wide naked area behind; occipital process equal to one eighth the distance from its tip to the origin of the dorsal, bordered by 2 scales on the sides; skull not strongly convex; frontal fontanel triangular, not half as long as the parietal; snout blunt; gill-rakers 9 on the lower gill-arch; maxillary three fourths the length of the eye, with two polycuspid teeth; four teeth in the inner series of the premaxillary; three or four tridentate teeth in the outer series; mandible with about ten 3- or 5-pointed teeth regularly decreasing in size backward; lateral line incomplete, the last 5 to 10 scales without pores; origin of the dorsal slightly nearer the tip of the snout than the base of the caudal; pectorals not reaching base of ventrals, ventrals not to anal; a much enlarged scale at the base of each caudal lobe.

A silvery lateral band; a small caudal spot not continued on the middle caudal rays; an indistinct humeral spot.

### 3. *BRYCONAMERICUS BOLIVIANUS* Pearson.

*Bryconamericus bolivianus* PEARSON, Indiana univ. studies, 1924, no. 64, p. 43, pl. 10, fig. 4 (Beni River).

HABITAT.—Upper Beni Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
17349 I Cotypes	9	28–48	Rio Colorado, Lower Bopi	Pearson
17350 I.	9	32–40	Popoi River, Upper Beni	Pearson
17351 I.	1	32	Rio Iniqui, Upper Beni	Pearson

Head 4 to 4.33; depth 4.33 to 5; D. 10; A. 15 to 16; eye 3 to 3.33; scales 4–35 to 38–2.5 or 3.

Slender, compressed; ventral and dorsal outlines evenly arched; second suborbital in contact with the preopercle below, leaving a large naked area behind; interorbital convex, its width less than the orbital length; frontal fontanel narrow, three fourths the length of the eye, the parietal fontanel 1.5 times as long and 3 times as wide at its widest point; occipital process short, its length equal to about one eighth of the distance from its tip to the origin of the dorsal; all teeth tridentate; maxillary with four or five teeth; four teeth in the inner series of the premaxillary, three or four teeth of about the same size in the outer series; mandible with four teeth of the same size followed by four or five teeth regularly decreasing in size; lateral line complete; origin of the dorsal equidistant from the tip of the snout and the base of the caudal, its margin

truncate; pectorals reaching base of the ventrals; ventrals not reaching the anal; anal slightly emarginate; an enlarged scale at the base of each caudal lobe.

A silvery lateral band, dark beneath the scales, ending at the base of the caudal in a small dark spot which is not continued on the middle caudal rays, no humeral spot; chromatophores on the back collected in a single band in the middle of each scale.

#### 4. *BRYCONAMERICUS HYPHESSUS* Eigenmann.

Plate 35, fig. 1.

*Bryconamericus hypheusus* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 32; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434; Mem. Carnegie mus., 1912, 5, p. 319 (Tumatumari, Lower Potaro River, Guiana).

HABITAT.—Lower Potaro, Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1070 C. Type	1	37.5	Tumatumari, Lower Potaro	Eigenmann
1071 C. } 11755 I. }	10	34-36	Tumatumari, Lower Potaro	Eigenmann
Paratypes				

Head 4.5; depth 4; D. 9; A. 16; scales 4-36-2; eye 2.66-2.75; inter-orbital equals eye.

Slender, but compressed, greatest depth over tip of pectorals, ventral and dorsal outlines equally arched; preventral area rounded with normal scales; postventral area short, compressed; predorsal area rounded, with a regular series of 10 scales.

Occipital process very short, only about  $\frac{1}{8}$  of the distance between its base and the dorsal, bordered by 2 scales on the sides; skull convex, smooth, a groove above the eye just within the orbital rim; frontal fontanel very short, triangular, not half as long as the parietal; snout blunt, the lower jaw included; mouth small, the maxillary a little more than half the length of the eye; cheeks not very wide, entirely covered by the second suborbital; maxillary with three or four broad, 5-pointed teeth; premaxillary with two series of 5-pointed teeth; four teeth in the inner row, four to six in outer row, the teeth of the outer row smaller than those of the inner row; the inner series parallel with the outer except that the third tooth of the outer series is withdrawn from the line of the rest; dentary with seven or eight graduated 5-pointed incisors.

Scales very regularly imbricate without interpolated or omitted scales; about 3 scales on the base of each caudal lobe; scales of the sides usually without

lines, those of the tail sometimes with a single line; anal sheath very narrow, of a single series of minute scales extending along the greater part of the base of the fin; lateral line decurved.

Origin of dorsal a little behind the middle of the body, over the middle of the ventrals, highest dorsal ray  $4\frac{1}{2}$  in the length; adipose fin behind the vertical from the base of the last anal ray; caudal forked, the longest rays a little greater than the depth; anal slightly emarginate; ventrals reaching anal, pectorals to ventrals or but a trifle shorter.

Hyaline, a conspicuous silvery lateral band; sides of head silvery; a vertical humeral spot crossing the 2d scale of the lateral line; three parallel dark lines along the middle of the back; scales of the back margined with several rows of chromatophores; chromatophores along base of anal and scattering ones on the sides, a band of chromatophores below the silvery band; a narrow dark band from the tip of the first (short) dorsal ray to the tip of the penultimate; tips of the longer rays and bases of all the rays hyaline; caudal everywhere punctate except at the tips of the rays and a triangular patch adjoining the middle rays above and below, these parts hyaline; tips of highest anal rays milky; tips of the other rays dark, the dark continued across the longest rays at the same level; pectorals and ventrals more or less dotted.

# 5. BRYCONAMERICUS GROSVENORI, sp. nov.

Plate 99, fig. 2.

HABITAT.—Rio Urubamba Basin, Peru.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
31562 Type	1	58	Rio Comerciato	Heller
7055 a-b C. } 13757 a-e I. }	16	60 <sup>1</sup>	Rio Comerciato	Heller
—	1	—	Santa Ana, Rio Urubamba	Heller
7056 C. } 13761a-b I. }	9	40 <sup>2</sup>	Santa Ana, Rio Urubamba	Heller
16048 I.	4	70 <sup>1</sup>	Santa Clara	Eigenmann

Near *B. hyphessus* and *B. microcephalus*.

Head 4.3; depth 3.75; D. 10; A.  $\frac{1.6}{3}$ ,  $\frac{1.7}{3}$ ,  $\frac{1.8}{1}$ ; scales  $5\frac{1.6}{1}$ ,  $\frac{4.1}{4}$ ,  $\frac{4.2}{2}$ ,  $\frac{4.3}{1}$ ; eye 3.5; interorbital 3 in the head.

<sup>1</sup> Largest specimen.

<sup>2</sup> Largest to base of caudal.

Long and slender. Snout narrow, blunt, mouth subterminal; predorsal and preventral areas rounded; about 15 predorsal scales; occipital process very short; frontal fontanel long, pointed, the frontals not united, but in contact forward; maxillary very convex, its free margin much shorter than eye; teeth all narrow, tricuspid, three in the anterior, four in the inner series of the premaxillary; four teeth in the maxillary, eight or nine in the mandible graduated from the fourth to the last.

Gill-rakers 3 + 8.

Origin of dorsal very little nearer snout than to base of caudal, the fin truncate, its rays nearly coterminous when depressed, the highest a little less than head less snout; caudal lobes pointed, nearly equal to length of head; base of anal about equal to length of caudal peduncle, a little less than head; pectorals not to the ventrals, the ventrals not to the anal.

Scales with several nearly parallel radial striae, everywhere regularly imbricate, without interpolated rows; caudal naked, the anal sheath reduced to a very few scales in a single series at base of the anterior rays; lateral line complete.

A bright, silvery lateral band; a faint, vertical humeral spot; a caudal spot not extending to end of middle caudal rays.

For Gilbert H. Grosvenor, Editor of The National Geographic Magazine, whose kindly interest made possible the expedition to Peru.

#### 6. BRYCONAMERICUS MICROCEPHALUS (Ribeiro).

*Astyanax microcephalus* RIBEIRO, Kosmos, 1908, no. 19 (Rio Bethany).

HABITAT.—Southeastern Brazil.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
— Nat. mus. Rio de Janeiro. Type.	1	69	Rio Bethany	
5494 C.	1	65	Bethany near Iporanga	Krone

Through the courtesy of Dr. Ribeiro, I have been able to examine the type of this species. Mr. Krone presented Mr. Haseman with a second specimen.

Head 4.33; depth 3.75–3.5; D. 10; A. 16 or 17; scales 5–38 to 40–4; eye 3 in the head, a little greater than the interorbital; snout equal to half the postorbital part of the head; depth of caudal peduncle equals postorbital part of head.

Subfusiform, robust above ventrals, caudal peduncle slender, preventral area rounded, with about 13 scales, predorsal area rounded, with a median series of 13 scales. Occipital process  $\frac{1}{8}$ – $\frac{1}{10}$  in the distance from its base to the dorsal, bordered by  $2\frac{1}{2}$  scales on the sides; width of second suborbital equals two thirds the length of the eye, in contact with the preopercle below leaving a naked area behind; frontal fontanel extending to above anterior margin of lens very narrow and considerably shorter than the parietal; maxillary-premaxillary border equal to length of snout and half the eye; snout blunt; four or five teeth in the outer series of the premaxillary, in a wavy line, four teeth in the inner series; maxillary with five or six rather large teeth of nearly uniform size, occupying nearly half the length of the free margin; each ramus of the lower jaw with about ten nearly regularly graduate teeth, all the teeth tricuspid.

Gill-rakers 6 + 9. Several of the gill-filaments provided with cysts of various sizes.

Scales thin, regularly arranged, lateral line nearly straight; caudal naked; anal with a few scales along its base in front.

Origin of dorsal nearer snout than base of middle caudal rays by .5–1 orbital diameter; dorsal truncate, the tips nearly continuous, the highest ray about equal to head without snout; origin of anal on the vertical from the last dorsal ray; ventrals not reaching anal; pectorals not reaching ventrals by 2 or 3 scales.

A large vertical humeral spot, crossing the 3d–5th scales of the lateral line.

This species resembles *Piabina argentea*. In its more prominent lower jaw and the arrangement of the teeth it is a typical *Bryconamericus*.

## 7. *BRYCONAMERICUS DIAPHANUS* (Cope).

Plate 69, figs. 11, 12; Plate 85, fig. 4.

*Tetragonopterus diaphanus* COPE, Proc. Amer. philos. soc., 1878, 17, p. 691 (Peruvian Amazon); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 282. *Astyanax diaphanus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 339, fig. 27. *Bryconamericus diaphanus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434

HABITAT.—Marañón Basin.

One specimen 21217 Acad. nat. sci. Phil. Type. 40 mm.<sup>1</sup> Peruvian Amazon. Orton.

Head 10 mm.; depth 12 mm.; eye 4 mm.; interorbital 4 mm.; maxillary 2.5 mm.; mandible 4 mm.; D. 10; A. 20; scales  $4\frac{1}{2}$ –37–3.

Slender elongate, dorsal and ventral profiles little arched; preventral area rounded, without a median series of scales; postventral area narrowly rounded;

<sup>1</sup> To base of caudal.

predorsal area rounded, with a median series of about 10 scales, a similar series behind the dorsal.

Occipital process about as broad as long,  $\frac{1}{7}$  of the distance from its base to the dorsal; anterior fontanel sharply angular in front, about  $1\frac{1}{2}$  in the length of the posterior, exclusive of the groove; interorbital rounded, second suborbital very large, covering the entire cheek, *overlapped* in front by the first suborbital; snout blunt, mouth small; five teeth in the first row of the premaxillary, the third slightly withdrawn, four in the second; denticles of the second row of teeth in a slight crescent; maxillary with two teeth similar to those of the second premaxillary row; mandible with four graduated teeth, and a number of similar, but small teeth on the sides.

Gill-rakers 5 + 12, the longest  $\frac{1}{4}$  the eye; gill-filaments 2.7 in the length of the eye.

Scales cycloid, regularly imbricate, no supplemental rows over the anal; lateral line nearly evenly arched its entire length, parallel with the row of scales below it; each scale with 2 to 4 radial striae; caudal naked; anal with a sheath of a single series of scales; a well-developed axillary scale.

Dorsal equidistant from tip of snout and base of caudal; anal basis equals the distance between the dorsals; origin of anal just behind the vertical from the last dorsal ray, equidistant from base of pectoral and base of caudal; ventral small, its origin equidistant from tip of snout and 5th scale beyond the base of the last anal ray, not reaching anal; pectorals not quite to ventrals.

Iridescent brassy, a vertical humeral spot over the 3d to the 5th scale of the lateral line; another dark cross shade over the 8th scale; a faint caudal spot, extending on the middle caudal rays; a silvery lateral band.

## S. *BRYCONAMERICUS NOVAE* Eigenmann and Henn.

Plate 42, fig. 3.

*Bryconamericus novae* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 24, p. 234.

HABITAT.—Eastern tributary of the Tocantins near San Francisco Basin.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3568a C. Type	1	56	{ Below Cachoeira da Velha, near Piabana, Rio Novo of Rio Tocantins	Haseman
3568 b-j C.	9			Haseman
13308 I.	3	40-50		Haseman



Allied to *B. hyphessus*, differing in being less elongate, having the dorsal profile more arched and having an additional row of scales below the lateral line. Possibly identical with *B. diaphanus* (Cope).

Head 4; depth 3.2-3.6; D. 10; A. 18-20; scales 4-36-3; eye 2.4, a little greater than the interorbital.

Gill-rakers 6 + 5, those of the upper limb minute.

Slender, compressed, dorsal and ventral profiles equally but only slightly arched; preventral area rounded, without a regular median series of scales; postanal area rounded, with 6 median scales; predorsal area with a median series of about 10 scales. Occipital process short, about one seventh of the distance from its base to the dorsal, bordered by 2 scales on the sides; interorbital flattened or slightly convex; frontal fontanel triangular, as wide as the parietal and two thirds as long as the parietal without the occipital groove.

Snout blunt, lower jaw not extending beyond upper; maxillary slender, extending to suture between first and second suborbitals, its length four fifths that of the eye; cheeks not very wide, covered by the expanded second suborbital, the anterior angle of which is overlapped by the first suborbital.

Maxillary with two or three minute tricuspid teeth in the inner angle near its symphysis with the premaxillary. Three to six conically tricuspid teeth in the first row or outer series of the premaxillary, the second, or tooth next the symphysial tooth, and the fourth are set back. These teeth are variable in number; there may be four on one side and five on the other or as in the type, or six on the right side and three on the left. Inner series of premaxillary of four 3- or 4-pointed teeth. Mandible with four large 5-pointed teeth and a variable number of small tricuspid teeth on the sides.

Scales cycloid, regularly imbricate, without interpolated or omitted scales; anal sheath of a single row of bifid scales on the base. Fourth lateral series or series above lateral line horizontal, of large scales, their vertical height about three fourths that of eye. Lateral line decurved, parallel with the row of scales below it.

Dorsal origin about equidistant from tip of snout and base of middle caudal rays, height of its longest ray about 4.5 in the length; anal origin one scale behind vertical from last dorsal ray and equidistant from base of pectoral and base of caudal. Ventrals shorter than the pectorals, not reaching the anal. Pectorals barely reach ventrals, their length equal to the head minus the snout.

Straw colored, top of head darker but without a predorsal line; a broad postdorsal color band to caudal base. Cheeks and operculum bright silvery; a

broad horizontal silvery lateral stripe just above the lateral line, terminating in a dusky caudal stripe or spot on caudal peduncle and base. A faint vertically elongate humeral spot under the third and fourth scales of the lateral line.

### 9. *BRYCONAMERICUS STRAMINEUS* Eigenmann.

Plate 37, fig. 1; Plate 75, figs. 6-8.

*Bryconamericus stramineus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 105; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Paraguay, Rio San Francisco and south to the Uruguay.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11519 I. Type	1	49.5	Piracicaba	Von Ihering
—— Paratypes	2	44, 54	Uruguay River	Wyman
11629 I	2	47, 67	Piracicaba	Von Ihering
3569 C.	10	51-74	Cacequy	Haseman
3570 C.	6	36-40	Sete Lagoas	Haseman
3571 C.	2	38, 40	Uruguayana	Haseman
3572 C.	3	55-62		Haseman
3573 C.	1	55	Mogy das Cruzes	Haseman
3574 C.	1	51	Caceres	Haseman
3575 C.	5	34-40	Barreiras Lagoas of Rio Grande	Haseman
3576 C.	1	36	Januaria	Haseman
3577 C.	4	29-47	Pirapora	Haseman
3578 C.	1	—	Joazeiro	Haseman
3579 C.	11	60-73	São João del Rei	Haseman
3580 C.	13	29-51	Jaguara	Haseman
3581 C.	74	56-76	Salto Avanhandava, below the Fall	Haseman

Head 4.5-4.75; depth 4.25-4.5; D. 10; A. about 22; scales 5-38-3 or 3.5; eye 2.75-3, equals interorbital in adult.

Extremely slender, elongate, the ventral profile slightly more arched than the dorsal; head bluntly rounded, the upper and lower jaw of nearly equal size. Preventral area rounded, postventral more narrowly so; predorsal area rounded, with a median series of 12 scales.

Occipital process very short, about  $\frac{1}{4}$  of the distance from its base to the dorsal; 2 or 3 scales in contact with each side; frontal fontanel equals the parietal fontanel without the occipital groove; the second suborbital covering the entire cheek, its lower anterior angle being prolonged forward, overlapped by the first suborbital above; mouth large, maxillary slender, about equal to the

length of the eye; three to five teeth in the outer series of the premaxillary, if more than three the second is withdrawn from the line of the rest, the first and fifth thrown forward, approaching the condition in *B. exodon*; front teeth in the inner series narrow, 5-pointed, the middle point much the longest; maxillary with one or two teeth; dentary with four larger and several smaller teeth on the sides.

Scales cycloid, everywhere regularly imbricate; caudal naked; lateral line rather sharply decurved in front, the rows of scales below it parallel with it.

Origin of dorsal in middle of body, its height 5–5.5 in the length; origin of anal and base of last dorsal ray equidistant from snout or the anal a little nearer snout; base of anal equals distance of dorsal from base or tip of adipose; ventral reaching  $\frac{2}{3}$  or  $\frac{3}{4}$  to anal, its origin and the 2d or 3d scale in front of the dorsal equidistant from the snout, or equidistant from tip of snout and base or middle of last anal ray; pectorals reaching about  $\frac{3}{4}$  to ventrals.

Straw colored in alcohol, with a conspicuous silvery band; a very faint humeral spot; middle caudal rays with faint dots or with a well-developed spot; scales above the lateral band sometimes outlined with black.

#### 10. *BRYCONAMERICUS BOOPS* Eigenmann.

Plate 37, fig. 2.

*Bryconamericus boops* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 105; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Maldonado.

One specimen 20700 Type. About 76 mm., 60 mm. to base of caudal. Maldonado. T. G. Cary.

Head 4; depth 3.6; D. 10; A. 22; scales 5–38–4; eye equals postorbital portion of head, about 2.6 in head; interorbital about 2.7 in head.

Elongate, sciaenoid; ventral profile from chin to origin of anal nearly straight, dorsal profile nearly regularly and gently arched from the dorsal to the nares, then abruptly rounded, the lower jaw entirely included falling short of the tip of the snout; preventral area rounded, without a median series of scales; postventral area much more narrowly rounded; predorsal area rounded, with some median scales, otherwise the scales of one side bent over the back.

Occipital process about  $\frac{1}{2}$  of the distance from its base to the dorsal, bordered by  $2\frac{1}{2}$  scales on each side; interorbital convex; second suborbital leaving a naked strip bordering it behind, maxillary short,  $4\frac{1}{3}$  in the head; mandible a little over 3 in head; five tricuspid teeth in the outer series of the premaxillary, all

in line, forming a continuous series with the four 3- to 5-pointed teeth of the maxillary; four teeth in the inner series of the premaxillary. Four larger teeth in the dentary and several similar or conical, smaller teeth on the sides.

Gill-rakers very short, about 8 + 12.

Scales irregularly notched, with a variable number of striae, deeply and very regularly imbricate, the exposed edges of those between the dorsal and lateral line more than twice as high as wide, those above the anal forming bands; no interpolated scales; caudal naked, except for the basal sheath; anal sheath of a single series of scales on the anterior half of the anal; a well-developed axillary scale.

Origin of dorsal equidistant from snout and caudal, the penultimate ray  $1\frac{2}{3}$  in the highest, which is 4.3 in the length; origin of anal under the last ray of the dorsal, its base equal to distance of dorsal from tip of adipose; ventrals scarcely to anal, their base and the 4th scale in front of the dorsal equidistant from snout; pectorals reaching slightly beyond origin of ventrals.

Frosted silvery, a humeral spot above the 4th and 5th scales of the lateral line; a plumbeous lateral band, becoming darker on the caudal peduncle; the middle caudal rays dusky; dorsal, except the tip of the first two rays, dusky.

#### 11. *BRYCONAMERICUS EXODON* Eigenmann.

Plate 75, figs. 3, 5, 13, 15.

*Bryconamericus exodon* EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 139 (Asuncion, Puerto Max); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

*Poeciliurichthys dichrouros* EIGENMANN & KENNEDY (in part), Proc. Acad. nat. sci. Phil., 1903, p. 522 (Asuncion).

HABITAT.—Paraguay Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10298a I. Type	1	45	Puerto Max	Anisitis
10298 I.	5	42–44	Puerto Max	Anisitis
11264 I.	3	35–38	Asuncion	Anisitis
11297 I.	3	39–40	Asuncion	Anisitis
2969 C.	1	40 <sup>1</sup>	Rio Jaurú	Haseman
2954 C.	10	23–44	Asuncion	Haseman
2955 C.	8	26–57	Villa Hays	Haseman
3559 C.	4	17–26	Corumba	Haseman

Head 4.33–4.4; depth 3.66–4.2; D. 9 or 10; A. 23–25; scales 5–39 or 40–4; eye not quite 3; interorbital 3.

<sup>1</sup> To base of caudal.

Slender, tapering regularly from near the middle of the pectorals to the caudal; preventral area rounded; predorsal area bluntly keeled, with about 12 scales, not forming an uninterrupted median series.

Occipital process very short, about as wide as long,  $\frac{1}{8}$  of the distance from its base to the dorsal; interorbital convex; frontal fontanel as wide as the parietal, half as long as the parietal with the occipital groove; mouth terminal, the maxillary nearly equal to the eye; second suborbital covering the entire cheek; maxillary with two, three, or more pointed teeth; premaxillary with four, five, or more pointed teeth of the usual sort in the inner series; outer series consisting sometimes of five teeth in each premaxillary, the second and fourth teeth withdrawn from the line of the first and fifth and alternating with the space between the first and second and third teeth of the inner series; the anterior series thus form two imperfect series. The first, third, and fifth teeth directed forward slightly; sometimes there are but four or three teeth, in which case the first and last are directed forward and the other one or ones are withdrawn from the line connecting them. Dentary with four large, many-pointed teeth and several small, mostly conical ones on the side.

Gill-rakers very short, about 6 + 12.

Scales cycloid, with very few radiating striae, regularly imbricate, without interpolated series; caudal naked; lateral line but little decurved.

Dorsal equidistant from snout and caudal, more than an orbital diameter behind the ventrals; origin of anal under middle of dorsal, its margin oblique, but little emarginate; ventrals small, not reaching anal; pectorals not to ventrals. A small humeral spot; a well-defined silvery lateral band from in front of dorsal to caudal; middle caudal rays, margin and tip of caudal lobes black.

Alimentary canal equal to the entire length; vertebrae 12 + 23.

## 12. BRYCONAMERICUS PHOENICOPTERUS (Cope).

Plate 69, figs. 5, 9; Plate 85, fig. 3.

*Tetragonopterus phoenicopterus* COPE, Proc. Acad. nat. sci. Phil., 1871, p. 261 (Ambyiacu); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 279  
*Astyanax phoenicopterus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 338, fig. 26.  
*Bryconamericus phoenicopterus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Ambyiacu River.

One specimen 8074 Acad. nat. sci. Phil. Cotype. 60 mm. Ambyiacu, Ecuador.

Head 11 mm.; depth 14 mm.; length to base of caudal 46 mm.; eye 4 mm.; interorbital 3.5 mm.; maxillary 3.5 mm.; mandible 5 mm.; D. 10; A. 29 (26–27, Cope); scales 5–36–3.5.

Slender, elongate; dorsal and ventral profiles little arched.

Occipital process but  $\frac{1}{8}$  of the distance of its base from the dorsal; anterior fontanel rounded, not much more than half the length of the occipital fontanel without the groove; interorbital convex, with a shallow groove on each side; second suborbital unusually wide, covering the entire cheek below and leaving but an extremely narrow border behind; maxillary reaching to the end of the first suborbital, its anterior margin nearly straight; two teeth in the first row of the premaxillary; four teeth in the second row, each with a long median and two lateral cusps on each side; three similar teeth on the maxillary; four graduated teeth in the mandible, the last very small, and several similar but small teeth on the side.

Gill-rakers very short, 4 + 7?

Scales very thin, with numerous radial striae. Anal with a sheath of a single row of scales; caudal ? naked.

Dorsal equidistant from tip of snout and caudal; its height about equal to the length of the head; caudal  $3\frac{1}{2}$  in the length; anal emarginate, its length greater than the distance from the dorsal to the tip of the adipose; ventrals equidistant from snout and base of last anal ray, in advance of the dorsal, just reaching anal; pectorals just reaching ventrals.

A roundish, caudal spot continued to the end of the middle rays; a vertical humeral spot and a dusky streak some distance behind it; upper part of opercle spotted.

### 13. BRYCONAMERICUS ALBURNUS (Hensel).

*Tetragonopterus alburnus* HENSEL, Wiegml. archiv., 1870, p. 85 (Rio Cadea); STEINDACHNER, Süßswf. südöstl. Bras., 1876, **3**, p. 24; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 279.

*Bryconamericus alburnus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 431.

HABITAT.—Rio Cadea.

This species is known from the type only, a specimen 60 mm. to base of caudal. I am not sure that it belongs to the present genus. It may belong to *Astyanax*.

Head 4.83; depth 3.5; D. 10; A. 27; scales 5-37-3; eye 2.03; interorbital 2.5.

Maxillary without teeth, reaching to below middle of eye; pectorals reaching ventrals, ventrals nearly to anal; origin of dorsal nearly above middle between ventrals and anal; base of anal a little longer than from dorsal to tip of adipose; a vertical humeral spot, no caudal spot; a narrow silvery lateral band.

14. *BRYCONAMERICUS ASTICTUS* (Ulrey).

*Tetragonopterus astictus* ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 276 (Brazil).

*Bryconamericus astictus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 431.

HABITAT.—Brazil.

Known only from the type, a specimen 53 mm. long. All the points in the original description are given in the Key. It was collected by Charles Frederic Hartt for Cornell University and probably came from the Lower Amazon.

15. *BRYCONAMERICUS CISMONTANUS* Eigenmann.

Plate 91, fig. 4.

*Bryconamericus cismontanus* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 4; Mem. Carnegie mus., 1922, 9, p. 236.

HABITAT.—Base of Andes, east of Bogota.

One specimen 5459 C. Type. 60 mm. Villavicencio. Manuel Gonzales.

Allied to *B. iheringii*, differing in the teeth, anal, etc.

Head 3.8; depth 3; D. 10; A. 16; scales 5–37–4; eye 3, equal to interorbital; depth of caudal peduncle 1.5 in its length, 2 in the head.

Compressed, head slender, snout blunt; predorsal area with a median series of ten scales; occipital process about one seventh of the distance between its base and the dorsal, bordered on the side by two scales; interorbital slightly convex, blunt in front, about half as long as the parietal; mouth slightly more inferior than in *B. iheringii*; maxillary slender, about .66 as long as the eye; width of third suborbital about .66 diameter of the eye; a naked angle below the suture between the second and third suborbitals.

Five or six teeth in the outer series of the premaxillary, the second and fifth of the right side and the second and fourth of the left side withdrawn to form an incipient middle line; four teeth in the inner series; maxillary with two broad teeth; mandible with seven similar graduate teeth, the first three much the larger.

Gill-rakers very slender, 7 + 10.

Scales thin, regularly imbricate, with about 6 striae; anal with a few scales along the base of the anterior rays; caudal naked; lateral line nearly straight; no axillary scale?

Origin of dorsal fin very little nearer snout than caudal; the penultimate ray more than half the length of the longest, which is about 4.5 in the length; caudal equals length of the head; origin of anal below last dorsal ray; ventrals reaching anal, pectorals reaching ventrals.

A vertical humeral spot; middle caudal rays dusky.

5460 C. M., 13155 I.

Two smaller specimens 43 and 50 mm., from Rio Orquiza in the same drainage may belong to this species. The scales are 6-39 or 40-5; D. 10; A. 20. Maxillary with three teeth; denticles of teeth more pointed and arranged in a straight line, the five denticles of the inner series of the premaxillary of the type in a curve; outer series of the premaxillary composed of two to four teeth, the second behind and to one side of the first one and opposite the space between the first and second tooth of the inner series.

# 16. BRYCONAMERICUS PACHACUTI, sp. nov.

Plate 99, fig. 3.

HABITAT.—Rio Urubamba Basin, Peru.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
31563 Type	1	74 about	Santa Ana, Rio Urubamba	Heller
7053a-h C. } 13756a-t I. }	Paratypes 70	75 about <sup>1</sup>	Santa Ana, Rio Urubamba	Heller
7054a C.	2	46, 52	Rio Comerciato	Heller
16051 I.	—	73 <sup>1</sup>	Santa Ana	Eigenmann

Near *B. cismontanus* Eigenmann.

Head 4.33-5; depth 3.25-3.66; D. 10 (rarely 9); A.  $\frac{21}{3}$ ,  $\frac{22}{6}$ ,  $\frac{23}{4}$ ; scales 6- $\frac{37}{2}$ ,  $\frac{38}{3}$ ,  $\frac{40}{6}$ ,  $\frac{41}{1}$ ; eye 3-3.25; interorbital 2.75-3 in the larger specimens, equal to the eye in the smaller.

Compressed. Dorsal and ventral profiles equally arched, the dorsal arch highest at origin of dorsal, the ventral deepest in front of ventrals; preventral area rounded, with about 14 scales, the regularity of the median series broken below middle of ventrals; predorsal area rounded, with about 15 scales in a series which is entirely regular or regular to near occipital process; occipital process largely covered with scales, extending one ninth to the dorsal; frontal fontanel about one third as long as the parietal, considerably longer in the smaller specimens; interorbital convex; third suborbital in contact with the vertical limb of the preopercle, a naked margin behind it; fourth suborbital a small wedge between the third and the large fourth suborbital. Maxillary not quite reaching suture between second and third suborbital, nearly equal to the eye in length; premaxillary with four to six teeth in the outer irregular series;

<sup>1</sup> Largest specimen.



fourth teeth in the inner series; maxillary with two to five teeth, all, or only the upper ones 5-pointed; lower jaw with about ten teeth, the first three nearly equal, the last regularly graduate.

Gill-rakers 7 + 10, minute.

Origin of dorsal about half eye-diameter nearer the snout than to end of lateral line, the fin pointed, its successive rays shorter, the highest 4.5 in the length; adipose fin well developed; caudal lobes equal, about equal to length of head; anal emarginate, not distinctly lobed, its highest ray less than head without opercle; ventrals reaching anal or very little less; pectorals not reaching ventrals by the width of one or two scales. Scales everywhere regularly imbricate; lateral line considerably decurved; a row of scales along base of anterior half of anal; as many as 10 divergent, radial striae, very inconspicuous.

Silvery. A bright lateral band; a faint vertical humeral spot, evident with the lens only; no caudal spot, the middle more profusely peppered than the lobes; dorsal fin very sparingly peppered.

For the Inca Pachacuti, the eighth ruler of Peru bearing the title Pachacuti, and the greatest of all the Incas. "The greatest man that the American race has ever produced." *Markham: The Incas of Peru*, p. 94.

#### 17. *BRYCONAMERICUS IHERINGII* (Boulenger).

Plate 75, figs. 9a, 9b, 10; Plate 90, figs. 3, 4.

*Tetragonopterus iheringii* BOULENGER, Ann. mag. nat. hist., 1887, ser. 5, **19**, p. 172 (Rio Grande do Sul);

ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 285.

*Tetragonopterus fasciatus* STEINDACHNER (*non* Cuvier), Ichthyol. notizen, 1869, **9**, p. 8, pl. 3, fig. 1 (Montevideo).

*Astyanax iheringii* EVERMANN & KENDALL (in part), Proc. U. S. N. M., 1906, **31**, p. 82 (Rio Primero);

FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 347; EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 19; EIGENMANN, Ann. Carnegie mus., 1907, **4**, p. 138 (Sapuçay).

*Bryconamericus iheringii* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434.

*Tetragonopterus obscurus* EIGENMANN (*non* Hensel), Ann. N. Y. acad. sci., 1894, **7**, p. 635.

*Tetragonopterus pliodus* COPE, Proc. Amer. philos. soc., 1894, **33**, p. 90.

HABITAT.—Rio Grande do Sul, and La Plata Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
— Brit. mus.	2	—	—	Doria <sup>1</sup>
2956 C.	12	26-62	Sapuçay, Paraguay	Haseman
3560 C.	9	53-84	Cachoeira, Rio Jacuhy	Haseman
			Rio Grande do Sul	Haseman

<sup>1</sup> Labeled *cordovae*. Long, slender, heavy headed; interorbital equals eye, 3 in head. Scales 6-38-4; A. 23; 6-35-4; A. 21; depth  $3\frac{3}{4}$  in the length, equals length of head in one,  $3\frac{1}{5}$  in the other, in which it is deeper than length of head. One maxillary tooth.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3561 C.	1	60		Haseman
3562 C.	3	56-60	Rio Jacuhy	Haseman
3563 C.	1	52	Porto Alegre	Haseman
3564 C.	2	66, 72	Cacequy	Haseman
3565 C.	2	48, 53	Porto Uniao, Rio Iguassú	Haseman
3566 C.	7	52-75 <sup>1</sup>	Arroyo Miguelete, Montevideo	Haseman
3567 C.	3	28-35	Uruguayana	Haseman
4891 I.	5	70-80	Rio Grande do Sul	Von Ihering
10291 I.	4	50-58	Sapuçay	Anisits
10292 I.	7	35-50 about	Sapuçay	Anisits
11094 I.	1	61	Rio Primero	Titcomb
20699	1	72 about	Maldonado	Cary
847 part	1	72 about	Uruguay River	Wyman
11503 I.	2	38, <sup>2</sup> 63	Montevideo	Safford

Distinguished by its slender, bluntly conical snout.

Head 4-4.25; depth 2.6-2.8; D. 10; A. 18-23; scales 5 or 6-35 to 38-3.5;<sup>3</sup> eye  $2\frac{2}{3}$  to 3; interorbital 3 to 3+.

Compressed, the head slender, the body deep. Depth of the head at the base of the occipital process one half, or a little more than half, of the greatest depth of the body. Preventral region rounded, without a distinct median series of scales. Postventral area narrowly rounded. Predorsal area narrowly rounded, without a complete series of median scales.

Occipital process one seventh to one ninth of the distance from its base to the dorsal, bordered on the side by from 2 to  $2\frac{1}{2}$  scales. Interorbital slightly convex. Frontal fontanel triangular, not quite half as long as the parietal without the occipital groove. Maxillary about two thirds the length of the eye not reaching to end of first suborbital. Mandible about equals the eye. Snout very blunt, the lower jaw entirely included. Premaxillary with three to five teeth in the first series, which is more or less regular, and four teeth in the second series. Maxillary usually with three or four teeth, rarely two or five. Dentary with four large teeth and several small ones on the side.

Gill-rakers about 8 + 11.

Scales cycloid, with variable number of striae, regularly imbricate, without interpolated scales or rows of scales. Caudal sheath very short. Anal sheath

<sup>1</sup> The largest specimen is a male.

<sup>2</sup> To base of caudal.

<sup>3</sup> Villa Rica (17 spec.) A. 20-22; scales 5-37 or 38-3.5.

of a single series of scales. Axillary scale well developed. Lateral line but little decurved, the rows of scales below it parallel with it.

Origin of dorsal fin equidistant from snout and caudal, the penultimate ray more than half as long as the longest, which is about 5 in the length. Caudal longer than head. Origin of anal at the vertical from the last dorsal ray or a little behind it. Ventrals below the vertical from the third scale in front of the dorsal, reaching to, or nearly to, the anal. Pectorals not reaching the ventrals.

Middle caudal rays dusky, dorsal and anal also sometimes dusky. Tip of first dorsal rays always colorless. Pectorals and ventrals sometimes dusky. A vertical humeral spot crossing the fourth and fifth scales of the lateral line.

# 18. *BRYCONAMERICUS EIGENMANNI* (Evermann and Kendall).

Plate 68, fig. 1; Plate 69, fig. 13.

*Astyanax eigenmanni* EVERMANN & KENDALL, Proc. U. S. N. M., 1906, **31**, p. 83, fig. 1 (Rio Primero).  
*Astyanax iheringii* EVERMANN & KENDALL (in part), Proc. U. S. N. M., 1906, **31**, p. 82.  
*Bryconamericus eigenmanni* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434.

HABITAT.—Rio Primero, western Argentine.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11071 I. Paratype	1	75 about	Rio Primero, Cordoba	Titcomb
11106 I.	1	75	Rio Primero, Cordoba	Titcomb

Head 4.25–4.5; depth 2.9–3.2; D. 10; A. 18–21; scales 5.5 or 6–38 or 39–3.5 or 4; eye 3–3.3; interorbital 2.72–3.

Elongate, not greatly compressed, dorsal and ventral outlines equally and not greatly curved; preventral area rounded, without a distinct median series of scales; postventral area narrowly rounded; predorsal area evidently keeled near the dorsal only; a median series of 11 scales in front of the dorsal.

Occipital process  $\frac{1}{6}$  of the distance from its base to the dorsal; interorbital strongly convex; frontal fontanel  $\frac{1}{3}$  as long as the parietal with the groove; second and third suborbital leaving a wide naked area between them and the vertical limb of the preopercle; mouth very small, the maxillary  $\frac{3}{4}$  as long as the eye; lower jaw entirely included, 3 in head; a series of five teeth in the outer series of the premaxillary forming a nearly straight series, four much larger teeth in the inner series; four teeth in the maxillary; nine graduated teeth in each ramus of the mandible.

Gill-rakers very short, 8 + 10.

Scales cycloid, regularly imbricate, margins forming almost regularly oblique lines on sides in front. Caudal sheath short, anal sheath of a single series of scales on anterior half of line. Axillary scale well developed. Lateral line but little decurved, rows of scales below it are parallel with it. No interpolated rows of scales.

Origin of dorsal about equidistant from snout and caudal. Penultimate ray more than half of the longest ray, which is 5 or  $5\frac{1}{2}$  in the length. Caudal short, about equal to the length of head. Anal very little emarginate, its origin a little behind the vertical from the last dorsal ray, its base equal to the distance between the dorsals. Origin of ventrals below the vertical from the third scale in front of the dorsal, not reaching the anal. Pectorals just reaching to base of ventrals.

Anal, margin of caudal, and dorsal dusky. An obscure humeral spot, and plumbeous lateral band.

This species is evidently closely related to *B. iheringii*. It differs from that species in having its dorsal and ventral profiles less convex, in its short caudal and long pectoral, and the wider naked area behind the suborbitals.

#### 19. *BRYCONAMERICUS SIMUS* (Boulenger).

##### Plate 69, fig. 7.

*Tetragonopterus simus* BOULENGER, Boll. Mus. univ. Torino, 1898, **13**, p. 3 (Chota Valley, northern Ecuador); REGAN, Ann. mag. nat. hist., 1908, ser. 8, **2**, p. 456; 1913, ser. 8, **12**, p. 278 (Pacasmayo). *Bryconamericus simus* EIGENMANN, Mem. Carnegie mus., 1922, **9**, p. 150.

HABITAT.—Chota Valley, Pacasmayo.

Boulenger identifies this species with the Ecuadorian specimens of *B. petenensis* Günther. According to Regan part of the specimens including the *B. petenensis* listed by Boulenger belong to a distinct species, *B. scleroparius*. He restricts *B. simus* to specimens with the characters given below.

11598 I. Cotype. 87 mm. Chota Valley. British Museum.

Head 4.33; depth 3 +; D. 11; A. 28; scales 6–39–4; eye 3.6 in the head, 1.6 in interorbital.

Heavy forward, tapering and much compressed near caudal; preventral area rounded, without a distinct median series of scales, predorsal area with about 11 scales, somewhat irregular near occipital process which is about one sixth of the distance between its base and the dorsal; head very much as in *B. eigenmanni*, broader, snout very short and blunt; suborbital to its angle as wide as eye which equals the maxillary. Five teeth in the outer row of the pre-

maxillary, those on one side on a straight line, those on the other with the second and third tooth withdrawn from the line; four much broader teeth on the second row. Two broad teeth on the maxillary; mandible with four larger teeth and about four minute ones on the sides.

Nine rakers on the lower gill-arch.

Origin of dorsal midway between tip of snout and base of caudal, shorter than head; caudal broad and short; origin of anal under last third of dorsal, its base more than one third of the length; ventrals reaching the anal; pectorals to the ventrals.

Scales without interpolated rows; scaling extending further on the lower caudal lobe than on the upper, anal sheath of a single row of scales. A well-developed axillary scale.

A faint plumbeous lateral band, most distinct in middle of body; no humeral spot, no caudal spot; middle caudal rays pale.

## 20. *BRYCONAMERICUS CASCAJALENSIS* Meek and Hildebrand.

*Bryconamericus cascajalensis* MEEK & HILDEBRAND, Field mus. Publication, 1916, no. 191, p. 284, pl. 19 (Rio Cascajal, Porto Bello, Panama); EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 150.

HABITAT.—Atlantic slope of Panama in the Rio Cascajal.

Head 3.8 to 4; depth 2.6 to 2.95; D. 10 or 11; A. 26 to 29; scales 40 to 48; predorsal 12 to 15, 8 between lateral line and origin of dorsal; eye 2.6 to 3 in head; snout 3.4 to 4.25 in head; maxillary .8 eye, with two teeth on upper end. Outer premaxillary row with ten irregularly placed teeth, inner series regular with eight teeth.

Dentary with eight strong teeth followed by abruptly smaller ones. Dorsal origin about midway between snout tip and caudal base. Anal origin slightly behind base of last dorsal ray. Ventrals inserted a little nearer to tip of snout than to base of last anal ray. Pectorals reaching ventrals.

A plumbeous band becoming almost black posteriorly. An elongate caudal spot, somewhat extending on the base of the central caudal rays. An obscure humeral spot. Breeding males with small bluish tubercles on head and scale margins, and small barblets on the fins. Differs from *B. emperador* in smaller scales, deeper lateral band, and in the tubercles on breeding males. (Condensed from Meek and Hildebrand).

## 21. BRYCONAMERICUS EMPERADOR (Eigenmann and Ogle).

## Plate 37, fig. 3.

*Astyanax emperador* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 26 (Empire Station, Panama).  
*Tetragonapterus emperador* REGAN, Ann. mag. nat. hist., 1908, ser. 8, **2**, p. 456 (Rio Grande de Terraba, Costa Rica).

*Bryconamericus emperador* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434; Mem. Carnegie mus., 1922, **9**, p. 150; MEEK & HILDEBRAND, Field mus. Publication, 1916, no. 191, p. 283, pl. 19.

*Bryconamericus terrabensis* MEEK, Field mus. Publication, 1914, no. 171, p. 108.

HABITAT.—Costa Rica, south to the Tuyra, on both slopes of Panama.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality
55651 U. S. N. M. Cotypes	—	35-52 <sup>1</sup>	Empire Station

Meek and Hildebrand took large numbers of this species on both slopes of the Canal Zone as well as in the Chorrera on the Pacific side north of the Zone and in the Tuyra Basin south of it.

Scales 8-39 to 45-6 or 7; A. 26-30; head 3.6 or 3.5; depth 2.7-3; eye large, 2.8-2.6 in head; interorbital 2.8-3.25 in head; maxillary long, equal to eye, having two or three narrow teeth.

Elongate, body deepest a little behind origin of pectorals. Predorsal area entirely sealed, anterior fontanel much shorter than the posterior.

Occipital process about  $\frac{1}{3}$  of the distance from its base to the dorsal, bordered by 2 scales on the sides; second suborbital covering the cheek to the lower limb of the opercle, leaving a narrow naked area behind, and a minute naked angle below the suture between the first and second suborbitals. Five teeth in the front series of the premaxillary, the second and third removed from the line, four broad teeth in the inner series of the premaxillary; four graduated teeth on the lower jaw and abruptly minute ones on the sides.

Scales not very regular, a few interpolated scales over the anal. About 6 striae on each scale. Caudal naked, anal sheath very narrow. Dorsal placed behind the origin of ventrals, its origin equidistant from front of eye and base of middle caudal rays or a little nearer the latter. Highest dorsal ray equal to head without opercle or nearly equal to length of head; pectorals reaching ventrals, ventrals to anal.

A faint humeral spot; caudal spot distinct, not reaching end of middle caudal rays. A silvery lateral band.

<sup>1</sup> To base of caudal.

[A smaller-scaled and small-headed variety, represented by Regan's recorded material, has been named *Bryconamericus terrabensis* by Meek. It may perhaps be a distinct race, approaching *B. cascajalensis*. G. S. Myers].

## 22. BRYCONAMERICUS ORTHOLEPIS Eigenmann.

### Plate 38, fig. 3.

*Bryconamericus ortholepis* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 15; Mem. Carnegie mus., 1922, 9, p. 150.

*Bryconamericus rubricauda* REGAN, Ann. mag. nat. hist., 1913, ser. 8, 12, p. 464 (Condoto).

HABITAT.—San Juan and Atrato Basins.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5088 C. Type	1	48	Raspadura	Eigenmann
5455 C.	1	40	Istmina	Wilson
11150 I.	1	63	Istmina	Wilson
11151 I.	57	—	Mouth of Rio Calima	Henn
5456 C. }	10	65-104	Raspadura	Wilson
11152 I. }				
5344 C. }	40	84 <sup>1</sup>	Tambo	Wilson
13021 I. }				
5345 C. }	4	87 <sup>1</sup>	Rio Calima near Boca del Dincho	Henn
13022 I. }				
5346 C. }	200	98 <sup>1</sup>	Condoto	Wilson
13023 I. }				
13024 I.	—	68 <sup>1</sup>	Raspadura	Wilson
5347 C.	1		Truando	Wilson

Head 3.66; depth 3; D. 11; A. 33; scales 6-38-5; eye .6 in snout, 2.6 in head; interorbital 2.9 in head; depth of caudal peduncle equal to its length, equal to the length of the eye.

Similar to *B. scopiferus*; preventral area rounded, with a regular series of 13 scales; the short postventral area trenchant; predorsal area rounded, with 7 regular median scales from the dorsal forward and then 3 larger, unsymmetrical scales; occipital process nearly equilateral, about one sixth of the distance from its base to the dorsal, bordered by 3 scales on each side; interorbital very slightly convex, but little decurved forward; mouth terminal; the maxillary-premaxillary border angulated, as long as the eye; second suborbital leaving an exceedingly narrow naked margin behind. Premaxillary with five teeth in

<sup>1</sup> Largest specimen.

the anterior series, the first, third, and fifth in front of the lower lip; three teeth in the maxillary; four large teeth in the mandible; minute ones on the sides.

Scales arranged with striking regularity, their margins well marked; caudal naked, without glandular scale; axillary scale well developed. A series of scales along the bases of the anal rays. Origin of dorsal equidistant from tip of snout and end of last scale of the lateral line; its highest ray a little less than the head in length, origin of anal equidistant with middle of dorsal from the tip of the snout; ventrals reaching the anal, pectorals slightly beyond tip of axillary scale.

Iridescent, nearly evenly covered with chromatophores; a black spot, not ocellated with lighter at the end of the caudal peduncle, not extending on the middle rays; a faint humeral spot crossing the third scale of the lateral line, a fainter dusky band above the seventh to the tenth.

This species is evidently closely allied to *B. scopiferus*, which has frosted, papery scales, a distinct silvery band, in which there are no chromatophores in front and below the caudal spot.

### 23. *BRYCONAMERICUS SCOPIFERUS* Eigenmann.

Plate 38, fig. 2; Plate 77, figs. 3, 5-8; Plate 97, fig. 2.

*Bryconamericus scopiferus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 16; Mem. Carnegie mus., 1922, 9, p. 150.

*Bryconamericus juanensis* REGAN, Ann. mag. nat. hist., 1913, ser. 8, 12, p. 464.

HABITAT.—Pacific slope of the Colombia, the Patia, Dagua, and San Juan Basins.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector	
5026 C. Type	1	90	Istmina	Eigenmann	
5027 C. } 12793 I. }	Paratypes	SS	38-105	Istmina	Eigenmann
5028 C. } 12794 I. }	Paratypes	120	108 <sup>1</sup>	Cisnero, Rio Dagua	Eigenmann
5029 C. } 12797 I. }	Paratypes	29	50-108	Cordova, Rio Dagua	Eigenmann
5445 C. } 11140 I. }		17	87 <sup>1</sup>	Rio Telembi, 8 miles above Barbacoas	Henn & Wilson
5446 C. } 11141 I. }		52	90 <sup>1</sup>	Barbacoas	Henn & Wilson
5447 C. } 11142 I. }		29	103 <sup>1</sup>	Rio Telembi	Henn & Wilson

<sup>1</sup> Largest specimen.



Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5448 C. } 11143 I. }	3	87 <sup>1</sup>	Rio Telembi	Henn & Wilson
5449 C. } 11144 I. }	12	88 <sup>1</sup>	Rio Magui	Henn
5450 C. } 11145 I. }	24	82 <sup>1</sup>	Patia between Magui & Telembi	Henn
5451 C. } 11146 I. }	6	70 <sup>1</sup>	Near mouth of Calima	Henn
5452 C. } 11147 I. }	Many	97 <sup>1</sup>		Wilson
5453 C. } 11148 I. }	Many	105 <sup>1</sup>	Istmina	Wilson
5454 C. } 11149 I. }	Many	102 <sup>1</sup>	Tado	Wilson

Head 4-4.6; depth 2.5-2.9; D. 11; A. 29-32; scales 6 (or 7)-39 or 40-5 or 6; rarely 38 or 42 scales; eye 2.4-2.7 in the head, equal to or very little less than the interorbital; base of anal 3 in the length.

Compressed, more or less elongate, dorsal and ventral profiles equally curved; prefrontal area rounded, without a distinct median series of scales; predorsal area bluntly keeled, with a median series of eleven scales. Occipital process one fifth or one sixth of the distance from its base to the dorsal, bordered by 2 or 3 scales on each side; skull smooth, very little convex; frontal fontanel but little shorter than the parietal without the occipital groove; snout short, jaws nearly equal; maxillary-premaxillary border angulated, equal to or very little longer than eye, the maxillary about three fourths the length of the eye; cheek except a narrow strip behind, entirely covered by the second suborbital which at its widest point is about two thirds as wide as the eye. Four or five teeth in the outer row of the premaxillary, four in the inner; two or three small teeth on the maxillary; four graduated teeth on the mandible and a few smaller ones on the sides. Dorsal equidistant from snout and caudal or a little nearer the snout, pointed, its high anterior rays longer than the head; adipose fin well developed; caudal lobes longer than the highest dorsal rays; anal emarginate, its origin about on the vertical from the last dorsal ray; ventrals not reaching pectorals, the latter to or nearly to the ventrals.

Scales regularly imbricate, the rows not deflected toward the anal; caudal naked, anal with a narrow sheath composed of one series of scales.

A silvery lateral band, a conspicuous oval black spot on the caudal peduncle,

<sup>1</sup> Largest specimen.

extending but little over the bases of the middle caudal rays. Region along base of anal and part of the fin bright brick-red.

The specimens from Cisnero and Cordova (formaline) differ from the above in having the depth 3-3.25. The pectorals are a little shorter than in the types. 5028 C.; 12794 I. Cisnero.

Breeding males with the head, fins, and margins of scales profusely covered with minute tubercles.

*Measurements of seven specimens from Istmina.*

D.	A.	Scales	Depth	Eye
11	30	6-38-5 $\frac{1}{2}$	2.66	2.5 equals interorbital
11	29	6-39-5 $\frac{1}{2}$	2.75	2.5 slightly greater than inter-orbital
11	29	6-39-5	2.66	2.5 slightly greater than inter-orbital
11	31	7-39-6	2.75	2.4
11	29	6-39-5		2.4
11	30	7-40-6	2.5	2.5
11	32	7-39-6	2.9	2.66

*Measurements of several specimens from Cisnero.*

D.	A.	Scales	Depth	Eye
11	30	6-40-5	3.25	2.7 equals interorbital
11	31	6-39-5	3.2	2.66
11	30	7-42-5	3	

Of eight others two have the anal 28, and six 30; two have the lateral line 40, and six 39.

24. *BRYCONAMERICUS SCOPIFERUS GUAITARAE* Eigenmann and Henn.

Plate 67, fig. 3.

*Bryconamericus scopiferus guaitarae* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 19, p. 7;  
EIGENMANN, Mem. Carnegie Mus., 1922, 9, p. 151.

HABITAT.—Patia Basin, Pacific slope of the Colombia.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5474 C. Type	1	76	Patia at mouth of Rio Guaitara	Henn
13168 I. Paratype	1	83	Patia at mouth of Rio Guaitara	Henn

Five smaller specimens from the same place may belong to the same variety.

Head 4.25; depth 3 $\frac{1}{4}$ ; D. 11; A. 27; scales 6-38 or 39-6; eye 1 $\frac{1}{7}$ -1 $\frac{1}{3}$  etc. in interorbital, 3-3.33 in the head; depth of the caudal peduncle equals its length.

Very similar to *B. simus* from the Chota Valley which lacks the caudal spot.

25. *BRYCONAMERICUS CAUCANUS* Eigenmann.

Plate 38, fig. 1; Plate 75, figs. 2, 9, 11.

*Bryconamericus caucanus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 17; Mem. Carnegie mus., 1922, 9, p. 151.

HABITAT.—Cauca and Patia Rivers, Atlantic and Pacific drainage of Colombia.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5031 C. Type	1	80	Piedra Moler, Rio Vieja	Eigenmann
5031 a } 12739 I. }	130	80 <sup>1</sup>	Piedra Moler, Rio Vieja	Eigenmann
5032 C. } 12796 I. }	60	84 <sup>1</sup>	Paila	Eigenmann
5033 C. } 12797 I. }	4	60 <sup>1</sup>	Cali	Eigenmann
5034 C. } 12798 I. }	40	66 <sup>1</sup>	Cartago	Eigenmann
5035 C. } 12799 I. }	50	72 <sup>1</sup>	Cali	Eigenmann
12800 I.	11	58 <sup>1</sup>	Boquia	Eigenmann
5383 C. } 13075 I. }	13	86 <sup>1</sup>	Patia, mouth of Rio Guaitara	Henn
17604	138	32-58	Paipay, Rio Crisnejas, Peru	Pearson
17605	4	34-82	Tingo de Pauca, Marañon, Peru	Pearson
17606	1	41	Rio Pusoc, above Balsas, Peru	Pearson
17603	Many	40-88	Balsas, Peru	Pearson

Allied to *B. peruanus*, abundant in the upper Cauca. Reaching a length of 84 mm.

Head 4-4.5; depth 2.9-3.25; D. 10; A. 25-28; scales 6-37 to 40-5 or 6 (usually 39 scales in the lateral line); eye 3-3.5 in the head, about equal to the snout, slightly less than the interorbital; base of anal 3-3.5 in the length.

Compressed, dorsal and ventral outlines nearly symmetrically and equally curved, depth of caudal peduncle equal or not quite equal to its length, 1.7-2 in the head. Preventral region rounded, without a regular median series of scales; predorsal area narrow, with a median series of 11-13 scales.

Occipital crest about one sixth of the distance from its base to the dorsal, bordered by 3 scales on the side; frontal fontanel considerably shorter than the

<sup>1</sup> Largest specimen.

parietal. Second suborbital leaving a very narrow border behind and at times a small angle below its anterior edge naked; maxillary a little more than 3 in the head, scarcely longer than the snout, equal to the eye. Usually four, sometimes five teeth in the front series of the premaxillary; four graduated teeth in a crescent and numerous smaller teeth on the sides of the lower jaw; maxillary with three teeth.

Origin of dorsal about equidistant from snout and caudal; middle caudal rays dusky.

Scales and otherwise as in *B. peruanus*.

## 26. BRYCONAMERICUS ALPHA Eigenmann.

Plate 91, fig. 1.

*Bryconamericus alpha* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 7; Mem. Carnegie mus., 1922, 9, p. 236.

HABITAT.—Base of Andes, east of Bogota.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5463 C. Type	1	59	Villavicencio, Oriente, Colombia	Gonzales
5464 C. } 13157 I. }	6	64 <sup>1</sup>	Villavicencio, Oriente, Colombia	Gonzales
13259 I.	16	35-62	Villavicencio, Oriente, Colombia	Gonzales
7066 C. } 13258 I. }	Many	76 <sup>1</sup>	Barrigon, Rio Meta	Gonzales

Allied to *B. caucanus*, differing among other things in the shorter maxillary.

Head 4-4.25; depth 2.75-3; D. 10; A.  $\frac{2.3}{7}$ ,  $\frac{2.4}{4}$ ,  $\frac{2.5}{1}$ ,  $\frac{2.6}{4}$ ,  $\frac{2.7}{1}$ ; scales 6 or 7-39 or 40-4 or 5; eye 2.66 in head, a little greater than interorbital.

Maxillary considerably less than the eye; mandible with four or five large teeth and smaller ones on the side; maxillary with  $\frac{2}{2}$ ,  $\frac{3}{4}$ ,  $\frac{4}{2}$  teeth where the denominator represents the number of specimens.

A vertical humeral spot, a broad lateral band black in formaline specimens, little if any broader on the caudal peduncle, continued as a dark band to the end of the middle caudal rays. Anal with a hyaline base, shading to a dark margin.

This species is very close to *B. caucanus* with which it may prove identical.

<sup>1</sup> Largest specimen.

## 27. BRYCONAMERICUS BETA Eigenmann.

Plate 91, fig. 2.

*Bryconamericus beta* EIGENMANN, Indiana univ. studies, 1911, no. 19, p. 7; 1920, no. 41, p. 11; Mem. Carnegie mus., 1922, 9, p. 236.

HABITAT.—Base of Andes, east of Bogota and eastward.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm	Locality	Collector
5465 C. Type	1	57	Villavicencio	Gonzales
5466 C. } 13158 I. }	9	75 <sup>1</sup>	Villavicencio	Gonzales
Paratypes				
13257 I.	13	58 <sup>1</sup>	Villavicencio	Gonzales
13256 I.	33	68 <sup>1</sup>	Barrigon	Gonzales
15140 I.	Several		Concejo, Rio Tiquirito, Venezuela	Pearse

Head 4–4.25; depth 2.65–2.8; D. usually 10, rarely 9; A.  $\frac{2.5}{1}$ ,  $\frac{2.6}{2}$ ,  $\frac{2.7}{6}$ ,  $\frac{2.8}{8}$ ,  $\frac{2.9}{4}$ ,  $\frac{3.0}{1}$ ; scales 5 or 6– $\frac{3.6}{2}$ ,  $\frac{3.7}{4}$ ,  $\frac{3.8}{1}$ ,  $\frac{3.9}{1}$ –3 or 4 to ventrals; eye 2.8–3, equal to or a little less than the interorbital; maxillary teeth  $\frac{1}{1}$ ,  $\frac{3}{2}$ ,  $\frac{2}{6}$ ; length of maxillary about .66 of the eye.

Base of upper caudal lobe sealed for a fourth, that of the lower for a third of its length.

Ventrals to or not quite to the anal; pectorals about to ventrals, sometimes falling a little short or extending a little beyond origin of ventrals.

Color much faded, a black line in the dark lateral band which extends to the end of the middle rays; a transverse humeral band, an obscure caudal spot.

The specimens 13256 are better preserved than the types. The pectorals extend to the second scale beyond the origin of the ventrals, rarely to the end of the third or the origin of the ventrals. D.  $\frac{9}{2}$ ,  $\frac{10}{18}$ ; A.  $\frac{2.6}{1}$ ,  $\frac{2.8}{7}$ ,  $\frac{2.9}{5}$ ,  $\frac{3.0}{5}$ ,  $\frac{3.1}{1}$ ,  $\frac{3.2}{1}$ ; head 4.25–4.66; scales  $\frac{3.7}{1}$ ,  $\frac{3.8}{6}$ ,  $\frac{3.9}{1}$ . The humeral spot is frequently well marked crossing the 2d and 3d scales of the lateral line; the lateral band overlying the black line is very faint except on the caudal peduncle where it widens and becomes darker.

## 28. BRYCONAMERICUS PERUANUS (Müller and Troschel).

Plate 37, fig. 4.

*Tetragonopterus peruanus* MÜLLER & TROSCHER, Hor. ichthyol., 1815, 1, p. 28, tab. 8, fig. 1 (Rio Lurín, Rio Rimac, Peru); CUVIER & VALENCIENNES, Hist. nat. pois., 1818, 22, p. 153; GÜNTHER, Cat. fish. Brit. mus., 1864, 5, p. 327; STEINDACHNER, Ichthyol. beitr., 1875, 4, p. 14; Flussf. Südamer., 1879, 1, p. 22 (Pacasmayo, Peru); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 276.

*Tetragonopterus maculatus* MÜLLER & TROSCHER, Wiegmann's arch., 1841, 10, 1, p. 89 (Lima).

<sup>1</sup> Largest specimen.

*Bryconamericus peruanus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434; Mem. Carnegie mus., 1922, **9**, p. 151.

*Tetragonopterus microphthalmus* GÜNTHER (in part), Cat. fishes Brit. mus., 1861, **5**, p. 324 (Rio Rimac); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad., 1895, **8**, p. 280; REGAN, Ann. mag. nat. hist., 1913, ser. 8, **12**, p. 278.

HABITAT.—Western slope of Peru and Ecuador.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20871	1	44	Near Trujillo	Squiers
26469	2	62, 65	Peru	
20689	20	—	Rio Rimac, Peru	Steindachner
5437 C. { 13125 I. }	Many	85 <sup>1</sup>	Puertoviejo, Ecuador	Henn
5438 C. { 13126 I. }	Many	125 <sup>1</sup>	Chone, Rio Manabi, Ecuador	Henn
13127 I.	2	110 <sup>2</sup>	Rio Chanchan, Naranjito, Ecuador	Henn
11502	1	62	Peru	Simons
— Field Mus.	15	67 <sup>1</sup>	Pacasmayo, Peru	Osgood
17591 I.	93	33–80	Pacasmayo, Peru	Pearson
17592 I.	10	24–65	Above Chilete, Peru	Pearson

Head 3.75–4.25; depth 2.5–3.25; D. 11; A. 27–32 (usually 29 or 30); scales 6 or 7–36 or 37–5 or 6; eye 2.75 in the younger, to 3.5 in the oldest; interorbital equals eye in young, the eye 1.2–1.4 in the interorbital in the old.

Head and anterior part of body heavy, tapering from near the pectoral to the caudal peduncle or more regularly elliptical; profile from the tip of the occipital to the nares steep and nearly straight, sharply decurved in front of the nares; preventral area rounded, without a median series of scales; postventral narrowly rounded; predorsal area narrowly rounded or obscurely keeled, with a nearly regular series of about 12 scales.

Occipital process about  $\frac{1}{6}$  in the distance from its base to the dorsal, 3 scales in contact with it on the side; interorbital smooth, convex; parietal fontanel without the groove nearly three times as long as frontal; suborbital leaving a naked border behind and a slight notch between it and the first suborbital; lower jaw heavy, heavier than the prenares region of the upper jaw; maxillary slender, equal to the eye; five teeth in the front series of the premaxillary, the second and fifth usually withdrawn from the line, in one case six teeth in the outer series and in three cases out of the fourteen, only four teeth; second series uniformly with only four teeth; dentary with four graduate teeth in a crescent and numerous small ones on the sides; maxillary with two or three teeth.

Gill-rakers 8 + 12.

<sup>1</sup> Largest specimen.

<sup>2</sup> Larger specimen.

Scales cycloid, each with numerous radiating striae, regularly imbricate, without interpolated scales; caudal naked; anal sheath of a single series of large, oval, thin, adherent scales; a large axillary scale; lateral line not greatly decurved, the row of scales below it parallel with it.

Origin of dorsal a very little nearer caudal than to tip of snout, its penultimate ray about half as long as the longest, which is about 4.5 in the length; caudal lobes not much longer than head; anal emarginate, its origin nearer the snout than the base of the last dorsal ray, its base longer than distance of tip of adipose from the dorsal; ventrals reaching anal or falling considerably short of it, their origin more than an orbital diameter nearer snout than the dorsal; pectorals falling short of the ventrals (?) or extending a little beyond their base (♂).

A vertical humeral spot across the 3d to 5th scale of the lateral line; a silvery lateral band; middle caudal rays black.

Vertebrae 14 + 19.

Alimentary canal somewhat longer than the entire fish.

## 29. BRYCONAMERICUS BREVIROSTRIS (Günther).

Plate 93, fig. 1.

*Tetragonopterus (Chalceus) brevirostris* GÜNTHER, Proc. Zool. soc. London, 1859, p. 420.

*Tetragonopterus brevirostris* GÜNTHER (in part), Cat. fishes Brit. mus., 1864, 5, p. 321 (Western Andes of Ecuador); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 274; BOULENGER, Boll. Mus. univ. Torino, 1898, 13, p. 1 (Rio Peripa, Rio Vices, western Ecuador).

*Astyanax brevirostris* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

*Tetragonopterus branickii* STEINDACHNER, Flussf. Südamer., 1879, 1, p. 21, pl. 1, fig. 3 (Rio Zarumilla on boundary of Ecuador and Peru); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 274.

*Bryconamericus brevirostris* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 151.

?*Astyanax riveti* PELLEGRIN, Bull. Mus. nat. hist., 1907, 13, p. 25 (Rio Poro at Santo Domingo de los Colorados, Ecuador); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

*Tetragonopterus (Astyanax) riveti* PELLEGRIN, Miss. Equateur, 1912, 9, p. .

*Astyanax notemigonoides* FOWLER, Proc. Acad. nat. sci. Phil., 1911, p. 506.

HABITAT.—West slope of Ecuador and of northern Peru.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5433 C. {	Many	86 <sup>1</sup>	Vices, Ecuador	Henn
13121 I. {			Vices, Ecuador	Henn
5434 C. {	Many	95 <sup>1</sup>	Rio Chanchan	Henn
13122 I. {			Naranjito, Ecuador	
			Rio Chanchan, Naranjito, Ecuador	Henn
5435 C. {	Many	90 <sup>1</sup>	Colimes, Rio Daule, Ecuador	Henn
13123 I. {			Colimes, Rio Daule, Ecuador	Henn

<sup>1</sup> Largest specimen.

This species connects the genus *Astyanax* through *A. festae* with the genus *Bryconamericus*.

Head 4-4.33; depth 2.75-3; D. 11; A.  $\frac{3.6}{2}$ ,  $\frac{3.7}{1}$ ,  $\frac{3.8}{4}$ ,  $\frac{3.9}{2}$ ,  $\frac{4.0}{2}$ ,  $\frac{4.3}{1}$  (the denominator indicating number of specimens, the numerator the number of anal rays); scales 7 or 8,  $\frac{4.3}{1}$ ,  $\frac{4.6}{2}$ ,  $\frac{4.7}{1}$ ,  $\frac{4.8}{3}$ ,  $\frac{5.0}{2}$ -7; eye 2.5-3, about equal to interorbital.

Compressed, elongate; ventral profile but little more arched than the dorsal; preventral area narrowly rounded, without a regular median series of scales; predorsal area rounded, scales of the two sides lapping over the median line except near the occipital process; no distinct median series of scales.

Occipital process equal to about one fifth of the distance between its base and the dorsal, bordered by 4 or 5 scales on the sides; frontal fontanel about 1.5 in the parietal; second suborbital in contact with the preopercle below, leaving a narrow naked margin behind and a naked angle below the suture between the first and second suborbital; maxillary about 1.5 in the eye, with two multicuspoid teeth, premaxillary with usually five teeth in the front row crowded, the second and fourth withdrawn from the line of the rest; sometimes but four teeth in the front series in which case the second and third are withdrawn from the line; four teeth in the second row of the premaxillary; mandible with four large graduate teeth in front, about five minute teeth in an incurving series, the fifth tooth from the symphysis sometimes much larger than at others; toothless area of the lower jaw longer than the space occupied by the minute lateral teeth.

Gill-rakers 5-7 + 13-15.

Origin of dorsal about equidistant from tip of snout and base of middle caudal rays; height of dorsal about equal to length of head; adipose fin small but well formed, caudal lobes 3-3.5 in the length; origin of anal under the last dorsal ray; ventrals not quite reaching anal; pectorals reaching beyond origin of ventrals.

Scales regularly imbricate except in a small area above the anterior anal muscles; each scale with from 2-12 radials; a row of scales nearly along the entire base of anal; caudal naked; axillary scale well developed; lateral line complete; lateral line sagging so that a line joining its ends runs along the upper edges of the scales above the middle part of the line or through the middle of the second row of scales above it.

Brassy; two obscure humeral spots formed by the absence of many chromatophores over the 7th-8th scales of the lateral line; middle caudal rays conspicuously black.



30. *BRYCONAMERICUS RICAE* Eigenmann.

Plate 37, fig. 5.

*Bryconamericus peruanus ricae* EIGENMANN, Bull. M. C. Z., 1908, **62**, p. 106 (Chitaria, tributary of the Revintazon River, Atlantic slope, Costa Rica).

HABITAT.—Atlantic slope of Costa Rica.

Three specimens 6267 Field museum. Cotypes. 84–95 mm. Chitaria, Costa Rica. A. Alfaro.

These specimens have the origin of the dorsal an orbital diameter nearer the snout than the base of the middle caudal rays. Scales 7–39 or 40–6; D. 10 or 11; A. 28–31; eye 3 in the head, much larger than in specimens of *B. peruanus* of the same size; interorbital equals eye.

This species is very probably synonymous with *B. scleroparius*.

31. *BRYCONAMERICUS SCLEROPARIUS* (Regan).

Plate 38, fig. 4.

*Tetragonopterus scleroparius* REGAN, Ann. mag. nat. hist., 1908, ser. 8, **2**, p. 455 (?Western Ecuador, Rio Iroquois, eastern slope of Costa Rica).

*Bryconamericus scleroparius* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434; ?REGAN, Ann. mag. nat. hist., 1913, ser. 8, **12**, p. 465 (San Juan); EIGENMANN, Mem. Carnegie mus., 1922, **9**, p. 152.

*Astyanax robustus* MEEK, Field mus. Publication, 1912, no. 163, p. 69 (Virginia River, Atlantic slope, Costa Rica).

?*Tetragonopterus petenensis* GÜNTHER (in part), Cat. fishes Brit. mus., 1864, **5**, p. 326 (Western Ecuador).

?*Tetragonopterus simus* BOULENGER (in part), Boll. Mus. univ. Torino, 1898, **13**, p. 2 (Chota Valley).

HABITAT.—Atlantic slope of Nicaragua and Costa Rica; Rio San Juan; ? Colombia and ? western Ecuador.

This species extends farther north than any other of the genus.

Through the courtesy of the late Dr. Meek I was able to examine two of his types of *Astyanax robustus*; these agree with the description of *B. scleroparius* and are evidently related to *B. ricae*. The Field museum has many specimens collected by Meek in tributaries of the Rio San Juan, Nicaragua.

Head 4.1–4.4; depth 2.8–3; D. 11; A. 28 or 29; scales 7–37 to 39–6; eye 3.5 in the head, 1.3–1.5 in the very convex interorbital.

Robust, dorsal and ventral profiles nearly equally curved, ventral surfaces rounded, without a distinct median series of scales, predorsal area with a regular series of 12 scales; head very convex, snout sharply decurved, mouth terminal; second suborbital about equal to the eye, leaving a narrow naked area behind; maxillary about equal to the eye; five teeth in the outer row of the premaxillary, four in the inner; maxillary with two broad teeth; mandible with four heavy,

graduated teeth, a few scarcely evident minute ones on the side in a series quite distinct from the larger ones.

Gill-rakers 7 + 10.

Scales regularly imbricate, no interpolated rows below the lateral line; caudal naked; a single series of scales along the base of the anal; axillary scale small.

Origin of dorsal an orbital diameter nearer snout than caudal, its margin truncate, its highest ray shorter than head; caudal lobes short, about equal to the length of the head; anal emarginate, its origin about equidistant from the snout with the last dorsal ray; ventrals small, not reaching anal, their origin on the vertical from the 3d scale in front of the dorsal; pectorals not reaching ventrals.

A caudal spot, middle caudal rays black, a faint humeral bar.

### 32. BRYCONAMERICUS ALFREDAE, sp. nov.

Plate 99, fig. 1.

*Bryconamericus alfredae* PEARSON, Indiana univ. studies, 1924, no. 64, p. 43 (*nom. nwl.*).

HABITAT.—Rio Urubamba and Rio Beni Basins.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
31564 Type	1	45	Santa Ana, Rio Urubamba	Heller
13755 L. Paratypes } 7440a-c C.	—	50–41 <sup>1</sup>	Santa Ana, Rio Urubamba	Heller
17327 L.	37	36–68	Lower Bopi, Rio Colorado	Pearson
17328 L.	7	40–48	Upper Beni, Rio Popoi	Pearson
17329 L.	4	37–50	Huachi	Pearson
17330 L.	1	48	Rurrenabaque	Pearson
17615 L.	14	32–66	Paipay, Rio Crisnejas, Peru	Pearson

Head about 4.3; depth 3.33; D. 10 (rarely 9); A.  $\frac{28}{1}$ ,  $\frac{29}{4}$ ,  $\frac{30}{2}$ ,  $\frac{31}{1}$ ,  $\frac{32}{3}$ ; scales 10–55 (about) –8; eye 3 in the length of the head; interorbital very little greater than eye.

Much compressed; dorsal and ventral outlines nearly equally curved; occipital process short; interorbital convex; fontanels large, the frontal fontanel widely separating the frontals; third suborbital leaving a very narrow naked area behind; maxillary nearly equal to eye, not quite reaching suture between second and third suborbital; mouth terminal, oblique; outer row of premaxillary with  $\frac{3}{2}$ ,  $\frac{4}{6}$  or  $\frac{5}{6}$  tricuspid or conical teeth, inner row with four 3- to 7-pointed

<sup>1</sup> To base of caudal.

teeth; maxillary with  $\frac{4}{7}$ ,  $\frac{5}{8}$  and  $\frac{6}{6}$  teeth; mandible with three or four large teeth and abruptly smaller conical ones (about nine) on sides.

Gill-rakers 8 + 11.

Dorsal pointed, second ray highest, but little shorter than head, reaching tip of third and fourth rays all of which extend beyond the other rays when the fin is depressed, origin of dorsal equidistant from snout and middle caudal rays; adipose well developed; caudal lobes sharply pointed, longer than head; anal emarginate, its highest rays about equal to head less opercle; ventrals about reaching anal; pectorals nearly to or slightly beyond origin of ventrals.

Scales very small, deciduous, mostly lost in all but two specimens, none of the specimens with complete squamation so that the lateral line cannot be given exactly; very few radial striae; a single row of scales along over half base of anal; caudal naked.

Silvery. A bright lateral band; sometimes a faint humeral spot; middle caudal rays black; upper part of second to fourth dorsal rays white, a faint bar of chromatophores from base of the anterior to the fifth or seventh dorsal rays; anal similarly marked, the margin behind the lobe sometimes dark, the posterior rays colorless or with a few scattered chromatophores.

It is possible that this is the young of *Acrobrycon ipanquianus*, which is known from specimens about twice as long as the largest of these, and in which the maxillary has eight or nine teeth.

For Mrs. Alfreda Mitchell Bingham, who has taken great interest in the natural history of Peru and gave material assistance in making possible an expedition to the Urubamba.

### 23a. ARGOPLEURA Eigenmann.

*Argopleura* EIGENMANN, Indiana Univ. studies, 1913, no. 18, p. 10 (*magdalenensis*).  
*Xenurocharax* REGAN, Ann. mag. nat. hist., 1913, ser. 8, 12, p. 463 (*spurrellii*).

TYPE.—*Bryconamericus magdalenensis* Eigenmann.

Characters of *Bryconamericus*, excepting as follows:—A glandular scale on the base of the middle caudal rays of the male, overarched a cavity beneath it; hooks on the anal of the male confined to the anterior part of the fin, strongest on a circular patch covering part of (about) the tenth to the fifteenth rays; anal with 33–45 rays; lower caudal fulcra in male frequently prominent, separate from the rest, continuous in profile with the tips of the anal rays; maxillary with one to three teeth.

A bridge between the Tetragonopterinae and the Corynopominae.

HABITAT.—Central and western Colombia.

*Key to the Species.*

- a.* Maxillary reaching suture between first and second suborbital, its tip frequently touching second suborbital; scales 7 (rarely 6)–42 to 45–5; A. 33–36; lateral band shading downward; numerous chromatophores between anal and lateral line, those near the anal arranged along the interhaemals.....1. *conventus* (Eigenmann).
- aa.* Maxillary not reaching suture between first and second suborbital; no interpolated rows of scales; lateral band sharply defined below.
  - b.* Six scales between origin of dorsal and lateral line; scales 6–41 to 43–5; A. usually 35 to 36, rarely 33 or 34, 37 or 38; base of anal 2.66–2.75 in the length; head 4.8–5; depth 3.9–4.2; a few chromatophores halfway between anterior part of anal and lateral line; chromatophores along base of anal rays.....2. *diquensis* (Eigenmann).
  - bb.* Five scales between the origin of the dorsal and the lateral line.
    - c.* A. usually 31 or 32, sometimes 29, 30, 33 or 34; base of anal 3, or a little more than 3 in the length.....3. *chococensis* (Eigenmann).
    - cc.* A. 35–45; head 4.75–5.33; depth 3–4; D. 10; scales 5–40 to 43–4; eye 2.33–3 in the head, equal or a little greater than interorbital; base of anal 2.4–2.6 in the length; origin of anal under anterior half of dorsal.....4. *magdalenensis* (Eigenmann).

## 1. ARGOPLEURA CONVENTA (Eigenmann).

## Plate 36, fig. 2.

*Bryconamericus conventus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 13.

*Argopleura conventa* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 148.

HABITAT.—Dique Canal, Colombia.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5060 C. Type	1	47 about	Soplaviento	Eigenmann
5061 C. } 12802 I. }	Paratypes 70	53 <sup>1</sup>	Soplaviento	Eigenmann

Head 4–4.33; depth 3.33–3.6; D. 9 or 10; A. 35 or 36 (rarely 33); scales 7 (rarely 6)–42 to 45–5; eye 2.5–3 in head, equal to or a little larger than the interorbital; base of anal 2.6 to 2.7 in the length.

Slender, dorsal and ventral profiles nearly equal, curved, tapering from the front of the long anal to the caudal peduncle, the depth of which is equal to its length, about half the length of the head; preventral area rounded, without distinct median series of scales; predorsal area rounded, with a median series of about 15 scales.

Occipital process about one sixth of the distance from its base to the dorsal, bordered by 3 scales on each side; interorbital smooth, convex; second suborbital leaving only a very narrow naked border behind its margin; mouth terminal, maxillary equal to the eye in length, reaching to the suture between first and

<sup>1</sup> Largest specimen.

second suborbitals; two or three teeth in the outer series of the premaxillary, four in the inner; one to three minute teeth on the maxillary; mandible narrow, with four larger teeth in a crescent, the third from in front frequently the largest, the fourth always small and followed by a series of suddenly minute teeth.

Scales thin, with few radiating lines, regularly imbricate except from above the middle of the ventrals where there are interpolated series causing the series below the lateral line to be deflected toward the anal; caudal naked; males with an enlarged scale overarching a pouch below the middle caudal ray; a single series of scales along the anterior anal rays; axillary scale small.

Origin of dorsal equidistant from snout and base of middle caudal rays; origin of anal on vertical from middle dorsal rays; ventrals reaching anal; pectorals to ventrals; lower caudal fulera prominent, continuous with the margin of the anal, the tip of whose last rays reach the fulera.

A diffuse silvery band, well demarked above, fading out downward; no humeral spot, middle caudal rays dusky; scales of the back margined with dusky. Numerous chromatophores between anal and lateral line, those nearest anal arranged in rows along the interhaemals.

## 2. ARGOPLEURA DIQUENSIS (Eigenmann).

Plate 36, fig. 3.

*Bryconamericus diquensis* EIGENMANN, Indiana univ. studies, 1913, 18, p. 14.

*Argopleura diquensis* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 148.

HABITAT.—Dique Canal and eastern Andes of central Colombia.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5072 C. Type	1	60	Soplaviento	Eigenmann
5073 C. } 12820 I. }	19	40-59	Soplaviento	Eigenmann
5480 C. } 13177 I. }	14	55 <sup>1</sup>	Alban, Quebrada	Gonzales

Head 4.8-5; depth 3.9-4.2; D. 10; A. usually 35 or 36, rarely 33-34, 37 or 38; scales 6-41 to 43-5 (5 above the lateral line in one, 4 below it in two); eye 2.6-2.75, greater than interorbital; base of anal 2.66-2.75 in the length.

Maxillary not reaching the suture between the second and third suborbital. No interpolated rows of scales below the lateral line; origin of anal on or very little behind the vertical from the origin of the dorsal.

<sup>1</sup> Largest specimen.

Lateral band sharply defined both above and below. Prominent chromatophores along the bases of the anal rays. A few chromatophores about halfway between lateral line and anterior part of anal.

### 3. *ARGOPLEURA CHOCOENSIS* (Eigenmann).

Plate 36, figs. 4, 5.

*Bryconamericus chococensis* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 14.

*Xenurocharax spurrellii* REGAN, Ann. mag. nat. hist., 1913, ser. 8, **12**, p. 463 (Condoto).

*Argopleura chococensis* EIGENMANN, Mem. Carnegie mus., 1922, **9**, p. 148.

HABITAT.—San Juan and Atrato Basins, Colombia.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5036 C. Cotypes	2	61, 67	Istmina	Eigenmann
5037 C. } 12939 I. } Paratypes	200	68 <sup>1</sup>	Istmina	Eigenmann
5038 C. Paratypes	3	60 <sup>1</sup>	Between Istmina & Puerto Negria	Eigenmann
5039 C. } 12940 I. } Paratypes	19	63 <sup>1</sup>	Puerto Negria	Eigenmann
5040 C. Paratypes	3	51 <sup>1</sup>	Boca de Raspadura	Eigenmann
5041 C. } 12941 I. } Paratypes	11	50 <sup>1</sup>	Boca de Certegui	Eigenmann
5042 C. } 12942 I. } Paratypes	75	68 <sup>1</sup>	Quibdo	Eigenmann
5445 C.	1	64	Tado	Wilson
11135 I.	1	67	Tado	Wilson
5446 C.	1	41	Certegui	Wilson
11136 I.	1	46	Certegui	Wilson
11137 I.	1	—	Tambo	Wilson
5447 C.	1	47	Truando	Wilson
11138 I.	1	51	Truando	Wilson
5448 C. } 11139 I. }	Many	55 <sup>1</sup>	Managru	Wilson

Head 4.3–4.5 in San Juan specimens, 4.33–4.75 in Atrato specimens; depth 3.4–3.75 in San Juan specimens, 3.75–4 in Atrato specimens; D. 10 (rarely 9); A. usually 31 or 32, sometimes 29, 30, 33 or 34; scales 5–39 to 41 (rarely 37)–4; eye 2.5–2.75 in San Juan specimens, 2.75–3 in Atrato specimens, equal to the interorbital.

Specimens from the San Juan deeper, more compressed than those from Atrato. Maxillary not reaching the suture between the first and second sub-

<sup>1</sup> Largest specimen.

orbitals; no interpolated rows of scales below the lateral line; base of the anal three or a little more than three in the length, its origin equidistant with the middle or end of the dorsal from the snout.

Lateral band sharply defined above and below. Caudal margined with dusky. Chromatophores at base of anal tending to arrange themselves along the interhaemals; more prominent in the Atrato specimens than in those from San Juan, most prominent in those from Boca de Certegui.

#### 4. ARGOPLEURA MAGDALENENSIS (Eigenmann).

Plate 36, fig. 1; Plate 75, figs. 1, 4, 12, 14; Plate 97, fig. 4.

*Bryconamericus magdalenensis* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 14.

*Argopleura magdalenensis* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 149.

HABITAT.—Upper Cauca and Middle Magdalena Basin.

<i>Specimens examined.</i>				
Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5063 C. Type	1	71	Girardot	Eigenmann
5064 C. }	Many <sup>1</sup>	72 <sup>2</sup>	Girardot	Eigenmann
12821 I. }				
5071 C. }	300	67 <sup>2</sup>	Apulo	Eigenmann
12826 I. }				
5065 C. }	89	58 <sup>2</sup>	Peñas Blancas	Eigenmann
12827 I. }				
5067 C. }	3 <sup>3</sup>	50 <sup>2</sup>	Honda	Eigenmann
5069 C. }	15 <sup>4</sup>	—	Cali, Cauca	Eigenmann
12824 I. }				
5068 C. }	20 <sup>5</sup>	55 <sup>2</sup>	Cartago	Eigenmann
12823 I. }				
5070 C. }	53 <sup>5</sup>	55 <sup>2</sup>	Piedra Moler	Eigenmann
12825 I. }				

Head 4.75–5.33; depth 3–4; D. 10; A. 40–43 in Magdalena between Peñas Blancas and Girardot; 34–43 (usually 35–37) Piedra Moler and Cartago; 40–45 in the Cauca at Cali; scales 5–40 to 43–4; eye 2.33–3 in the head, equal to or a little greater than the interorbital.

Maxillary not reaching the suture between the second and third suborbitals. No interpolated rows of scales below the lateral line. Origin of anal under first

<sup>1</sup> Head 5–5.33; depth 3–3.5; A. 40–43; scales 5–41 to 43–4.

<sup>2</sup> Largest.

<sup>3</sup> Head 4.75–5; depth 3–3.6; A. 39–45; scales 5–40 to 43–4.

<sup>4</sup> Head 5; depth 3.75–4; A. 40–45; scales 5–41 or 42–4.

<sup>5</sup> Head 4.75–4.9; depth 4; anal usually 35–37.

to middle dorsal rays, equidistant from tip of snout and base of middle caudal rays, in Girardot and Cali specimens, nearer caudal in Cartago and Piedra Moler specimens; base of anal 2.4-2.6 in the length.

Lateral band sharply defined both above and below. Caudal bordered more or less distinctly with dark. A row of chromatophores along the base of the anal rays, a few chromatophores halfway between front of anal and lateral line. All of these sometimes very faint, strongest in specimens from Cartago and Piedra Moler, where some chromatophores are arranged in series along the interhaemals as in *A. conventa*.

The specimens from Cartago and Piedra Moler have in addition a small circular black spot on the base of the anal which with their short anal may entitle them to a distinctive name. All of them have lost their scales.<sup>1</sup>

### 23b. PHENACOBRYCON Eigenmann.

*φέναξ* = false, and Brycon, a genus of the Characidae.

*Phenacobrycon* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 147.

TYPE.—*Bryconamericus henni* Eigenmann.

Characters of *Bryconamericus* and *Argopleura*, differing from the latter in having the lower caudal fulcra in the male not separated from the rest of the fin. Middle caudal rays in the male with a glandular scale; cheeks entirely covered by the suborbital; four teeth in the inner series of the premaxillary.

HABITAT.—Western slope of Ecuador.

### 1. PHENACOBRYCON HENNI (Eigenmann).

Plate 77, figs. 1, 2, 4; Plate 90, figs. 1, 2.

*Bryconamericus henni* EIGENMANN, Indiana Univ. studies, 1914, no. 19, p. 6 (Vinces).

*Phenacobrycon henni* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 147.

HABITAT.—Western slope of Ecuador.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector	
5410 C. Type	1	48	Vinces, Ecuador	Henn	
5411 C. } 13102 L. }	Paratypes	40+	46-53 <sup>2</sup>	Vinces, Ecuador	Henn
5411 C. } 13124 L. }	Paratypes	Many	—	Colimes, Rio Daule, Ecuador	Henn
13166 L.	1	—	Puertoviejo	—	
13167 L.	1	—	Chone, Ecuador	Henn	

<sup>1</sup> In Cartago specimens; one has 33 anal rays, one 34, five have 35, six 36, three 37, one has 38 and one 43.

<sup>2</sup> Largest specimen.



Very similar to *Landonia latidens*.

Allied to *Argopleura* in the presence of a glandular structure on the middle caudal rays, differing from it in the absence of prominent lower caudal fulera; first ten and last ten developed rays of the anal of the male with hooks.

Head 4; depth 3-3.5; D. 10; A. 33; scales 6-38-5; eye 3 in head, slightly greater than interorbital.

Slender, compressed; ventral surfaces rounded, predorsal surface with a median series of scales; snout pointed, mouth terminal, or superior; skull rounded, parietal fontanel much longer and wider than the frontal; maxillary about .66 as long as eye, not nearly reaching suture between first and second suborbital; maxillary with a single, minute, hidden tooth, premaxillary with three teeth in the front series and four in the back series; mandible with five graduated teeth; second suborbital leaving a naked angle below the suture between the first and second suborbitals.

Gill-rakers 12 + 11, all slender, the longest about half the length of the eye

Origin of dorsal equidistant from base of middle caudal rays and middle of eye, the fin pointed, less than length of head in height; adipose fin well developed; caudal lobes equal, about equal to length of head; anal falcate, the last ten rays in the male forming a second lobe; ventrals reaching to or nearly to anal; pectorals at least to ventrals, sometimes to end of axillary scales.

Scales very regularly arranged; a row of scales along base of anal rays; caudal naked; lateral line scarcely decurved.

Dorsal tip dusky; a small subcircular spot at base of the middle caudal rays; margin of upper caudal lobe dark; a submarginal dark band from the caudal spot along upper margin of the lower caudal lobe; a narrow lateral band.

Middle caudal ray of male covered with a thickened membrane, the scales on the base of the lower middle rays enlarged, arching over a space beneath them.

#### 24. HEMIBRYCON Günther.

ήμι, half, Brycon a genus of characins, from βρῦκω, to eat greedily.

*Hemibrycon* GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 318.

TYPE.—*Hemibrycon polyodon* Günther.

Hemibrycon has the characters of the species of *Bryconamericus* allied to *scleroparius*. In the adult at least of all species there are more teeth along the maxillary than in the species of *Bryconamericus*. The maxillary is usually slender and prolonged to near the middle of the pupil.

Elongate short-headed species of small size. Scales cycloid, lateral line

complete, caudal naked; cheeks usually with but a narrow naked margin behind, entirely covered below to the preopercle by the first and second suborbitals. Maxillary extending to or nearly to the end of the first suborbital; premaxillary and maxillary not half length of head; premaxillary with two series of teeth, the inner series composed of four (rarely five) teeth; maxillary in the adult with 5-25 in part, at least, 3- or 5-pointed, sometimes in part conical, teeth along half or more of its free margin; lower jaw with several (four to six) strong teeth; seven to ten small graduated or abruptly minute teeth in the side of the jaw.

Gill-rakers of the first arch much longer than those of the second, setiform. Middle caudal rays black.

HABITAT.—Eastern and western Peru, Ecuador, Colombia, and Trinidad.

Usually the last of the characins to disappear in ascending the mountains of Peru to Colombia, reaching at times 11,500 feet in elevation, but descending to sea level in northern Colombia and in Trinidad.

### *Key to the Species.*

- a. A. 21-25; scales not deflected toward the anal.
  - b. Pectorals reaching beyond origin of ventrals; maxillary extending to the suture between the second and third suborbital, with trienspid teeth extending along the greater part of its length; frontals not entirely separated by the fontanel; A. 21; scales about 5-41-5.
    1. *tridens* Eigenmann.
  - bb. Pectorals scarcely or not reaching ventrals; maxillary not reaching third suborbital; depth 3-3.5; predorsal area without complete median series of scales (except perhaps in *beni*).
    - c. Scales 6 or 7-41 to 43-5 or 6; eye 1.3-1.5 in interorbital; maxillary teeth extending not over half the margin; mandibular teeth graduate; lateral line sagging but little.
      2. *tolimae* (Eigenmann).
    - cc. Maxillary teeth extending over nearly the entire maxillary edge, maxillary extending to near suture between the second and third suborbitals; frontals entirely separated by the fontanel; A. 22, 26; scales 43-46.
      3. *helleri* Eigenmann.
    - ccc. Scales 6 or 7-42 to 46-5; about 11 strong teeth along almost entire edge of maxillary; A. 21 or 22.
      4. *beni* Pearson.
    - cccc. Scales 8 or 9-17 to 53-7 or 8; eye 1.25-1.33 in interorbital; maxillary teeth extending almost the entire length of the bone; mandibular teeth abruptly smaller on the side.
      5. *colombianus* Eigenmann.
  - aa. A. 26-29; pectorals reaching ventrals or further.
    - d. Lateral line 42-45.
      - e. Depth 3.66-4.5; eye 3; pectorals reaching to or nearly to the ventrals; lateral teeth of the mandible suddenly minute.
        6. *boquiae* (Eigenmann).
      - ee. Depth 3.5; eye 3 in head, 1 in interorbital; pectorals extending beyond origin of ventrals; maxillary reaching to end of the first suborbital; lat. l. 45.
        7. *polyodon* (Günther).
      - eee. Depth 2.66-3; eye 3.33-3.75 in head, less than interorbital; pectorals reaching ventrals in the male; lat. l. 42-43.
        8. *huambonicus* (Steindachner).
      - dd. Lateral line 38-40; a conspicuous caudal band.
        - f. Depth 3.3-4.
          - g. Head 4.5-4.75; eye 3-3.4 in the head, less than the interorbital; scales 8.5-38 to 40-5.5 or 6.5.
            9. *guppui* (Regan).
          - gg. Head 4-4.33; eye 2.5 in the head, greater than interorbital; scales 7.5-38-5.
            10. *toeniurus* (Gill).
        - ff. Depth 2.33-3; head 4.33-4.66; eye 3.25-3.5 in head. D. 10; A. 29-31; scales 9-39 or 10-6 to 6.5.
          11. *jelskii* (Steindachner).

- fff. Depth 2.4-3.55; head 3.45-4.5; eye 2.6 to 3.25 in head; D. 9 or 10; A. 27-29; scales 8-38 to 41-6. .... 12. *dariensis* Meek & Hildebrand.
- dhd. Scales 44-48; lateral line sagging so that a line connecting its origin and end passes under the dorsal through the middle or upper corner of the second row of scales above it; scales deflected towards the anal, pectoral reaching ventrals; eye equals interorbital; origin of anal under middle or anterior part of dorsal.
- h. Scales 7 or 8-45 to 48-5 or 6; depth of caudal peduncle less than its length; depth 3.2-3.4; A. 30-34; maxillary teeth 3-9, usually extending over less than half the free margin. .... 13. *dentatus* (Eigenmann).
- hh. Scales 9-44-6; depth of caudal peduncle equal to its length; depth 3; A. 31; maxillary teeth 6, on about half the free margin; lateral teeth of the mandible suddenly minute. .... 14. *decurrens* (Eigenmann).

# 1. HEMIBRYCON TRIDENS Eigenmann.

## Plate 96, fig. 3.

*Hemibrycon tridens* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 152.

HABITAT.—Southeastern Peru.

One specimen 13723 I. Type. 65 mm. Uruhuasi, southeastern Peru. Rosenberg.

Head 4.24; depth 4.24; D. 10; A. 21; eye 2.95 in the head, interorbital 3.5; scales mostly lost, judging from depressions, 5-41-5; length to base of caudal 53 mm.; caudal peduncle 11 mm.; depth of peduncle 4.5 mm.; origin of dorsal from snout 2.5 mm.; origin of ventrals from snout 22 mm.

More slender than *H. tolimae*, the dorsal and ventral profiles very little arched.

About 14 scales between dorsal and occipital process, which is about fourteen times in its distance from the dorsal; frontal fontanel about one third as long as the parietal fontanel; third suborbital narrowly in contact with the preopercle below, a naked area around its angle and behind its posterior border; maxillary reaching the suture between the second and third suborbital (not reaching the suture in *H. tolimae*), teeth all high with a tall, sharp, median point and a small lateral cusp on each side; five teeth in the front series of which the second and third are slightly withdrawn from the line of the rest; four teeth in the inner row, the fourth being quite small; nine to eleven teeth along most of the maxillary border, all of them tricuspid; three large tricuspid teeth in the front of the mandible, ten graduated tricuspid teeth along its side.

Ten rakers along lower angle of the first gill-arch.

Dorsal high, not very sharp pointed, its highest ray 11 mm.; adipose fin well developed; upper caudal lobe very slightly the longer, 12.5 mm.; anterior portion of anal high, the margin nearly straight, its highest ray 8 mm.; ventrals nearly reaching anal; pectorals nearly 11 mm. long, reaching beyond base of ventrals. Lower surface of ventral rays and all but the first two rudimentary and the last two rays of male with hooks.

A dark lateral band, caudal spot, and middle caudal rays dusky; distal parts of dorsal and anal and outer part of caudal lobes dusky; margin of lower caudal lobe dusky.

This species is evidently related to *H. tolimae* from which it differs in many minor points and from which it can readily be distinguished by the length of the maxillary.

## 2. HEMIBRYCON TOLIMAE (Eigenmann).

Plate 39, fig. 4; Plate 76, figs. 6-9, 11; Plate 97, fig. 1.

*Bryconamericus tolimae* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 18.

*Hemibrycon tolimae* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 153.

HABITAT.—Mountain streams of Colombia on both the eastern and western slopes of the Magdalena Basin; Pacific slope.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5057 C. Type <sup>1</sup>	1	118	Ibagué	Eigenmann
5058 C. } 12850 I. }	15	56-115	Ibagué	Eigenmann
5189 C. } 13180 I. }				
5190 C.	1	87	Quebrada, Chimbe?	Gonzales
5191 C.	1	78	Quebrada, Sayeta?	Gonzales
5192 C. } 13181 I. }	20	67 <sup>2</sup>	Quebrada, Channisal	Gonzales
5468 C. } 13160 I. }				
5469 C. } 13161 I. }	21	66 <sup>2</sup>	Quebrada de Sucesum, Santander	Gonzales
5481 C. } 13073 I. }				
5382 C. } 13074 I. }	25	86 <sup>2</sup>	Rio Juanambu, Upper Patia Basin	Henn

Resembling *Hemibrycon huambonicus* Steindachner.

Head 4.2-4.6; depth 3-3.5; D. 10; A. 21-25; scales 6 or 7-41 or 43-5 or 6; eye 3.5-3.75 in the head, 1.3-1.5 in interorbital; depth of caudal peduncle 2.5 in the greatest depth; length of caudal peduncle about half the depth of the body.

Elongate, rather heavy at the shoulders. Preventral area rounded, without

<sup>1</sup> It is quite probable that the specimens of *Bryconamericus schroepari* recorded by Regan from Ecuador and Colombia belong to this species.

<sup>2</sup> Largest specimen.

a median series of scales; postventral area narrowly rounded. Predorsal area narrowly rounded, with about 14 scales, the 4 to 6 nearest the occipital process in a median series; behind these there is no regular median series, the scales of one side or the other overlapping the median line. Occipital process short, about one eighth of the distance from its base to the dorsal; head broad, convex the snout rounded; the mouth terminal, the maxillary border making an angle with the premaxillary border; maxillary not quite reaching end of the first suborbital, equal to eye in the length; greatest width of second suborbital equal to the eye in the largest, narrower in the smaller. Usually four or five teeth in the front row of the premaxillary arranged in a straight line. Four teeth in the inner row of the premaxillary; maxillary with six to seven teeth, fewer in young arranged along not more than half the free margin of the maxillary. The maxillary teeth vary considerably in the extent of the border of the maxillary over which they are distributed. In the younger they may be restricted to near the upper angle as in species of *Bryconamericus*. Mandibular teeth nearly regularly graduated from the first to the last.

Origin of dorsal slightly nearer tip of snout than base of caudal, rounded or truncate, the longest ray scarcely reaching beyond tip of penultimate, 3.75 in the length; caudal lobes short, about equal to the length of the head; origin of anal below vertical from base of last dorsal ray.

Origin of ventrals equidistant from tip of snout and middle of last anal ray; ventrals short, reaching anus; pectorals not reaching ventrals by about three scales.

Scales regularly imbricate, not notably smaller over the anal musculature and the rows not deflected toward the anal; caudal naked but the lobes with a rather broad sheath of scales not attached to the rays; anal with a sheath of a few scales along the bases of the anterior rays, the scales not attached to the rays; axillary scale short; each scale with many (as many as 20 in some cases) radial striae. Lateral line complete, but little decurved.

A dull humeral band crossing the third and fourth scales of the lateral line; a band on caudal peduncle extending to end of middle rays.

This is the only species of the Characidae secured in the stream at Ibagué. It is very similar to *Bryconamericus scleroparius*.

## 3. HEMIBRYCON HELLERI, sp. nov.

Plate 96, fig. 2.

For Edmund Heller.

HABITAT.—Region of the Rio Urubamba, Peru.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
13565 Type	1	100	Rio Comerciato	Heller
7439a-c C. } 13754a-f l. }	Paratypes 17	45-97	Rio Comerciato	Heller
17611 l.	1	65	Paipay, Rio Crisnejas, Peru	Pearson

Head 4.5; depth 3+; D. 10; A.  $\frac{22}{2}$ ,  $\frac{23}{3}$ ,  $\frac{24}{9}$ ,  $\frac{25}{1}$ ,  $\frac{26}{3}$ ; scales 8-43 to 46-6; eye 3.5-3.8; interorbital 3; depth of caudal peduncle 1.7.

Very similar to *H. huambonicus*. Origin of ventrals equidistant from tip of snout and last fifth or end of base of anal; pectorals not reaching ventrals; anal shorter than in *H. huambonicus*.

Predorsal and preventral areas rounded; 15 to 17 predorsal scales; occipital process seven times in distance from its base to the dorsal; interorbital convex; frontal fontanel long, extending to the ethmoid or, the frontals very narrowly in contact behind the ethmoid in some of the largest specimens; maxillary about as long as the eye, reaching not quite to the suture between second and third sub-orbitals; about thirteen tricuspid teeth on the premaxillary, four or five teeth in front series of premaxillary, four in the second series; four large teeth on the mandible, abruptly minute ones on sides.

Gill-rakers 7 + 11.

Origin of dorsal equidistant from snout and base of midcaudal rays; margin of dorsal truncate, the depressed rays coterminous, the highest ray not equal to head. Caudal lobes equal, very little less than head; anal very slightly emarginate, the anterior rays about equal to snout and one half eye; ventrals short, equal to snout and eye, not reaching anal; pectorals a little shorter than head, not reaching ventrals by one to three scales. Scales regularly imbricate, no interpolated rows, the lateral line nearly straight, a few scales in a single row along base of anterior ray.

Middle caudal rays black; a large, obscure, vertical humeral spot; margin of anal dusky.

Anterior anal rays of male with hooks to near tip.

## 4. HEMBRYCON BENI Pearson.

*Hembrycon beni* PEARSON, Indiana univ. studies, 1924, no. 64, p. 42, pl. 2, fig. 6 (Espia, Rio Colorado, Lower Bopi).

HABITAT.—Rio Colorado.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality
17321 I. Cotypes	48 <sup>1</sup>	25-66	Espia
17347 I.	6	26-30	Rio Colorado, Lower Bopi

Head 3.75-4; depth 3-3.33; D. 10; A. 21 or 22; eye 2.66 to 3 times in the head; lateral line 6 or 7-42 to 46-5; about eleven strong teeth along almost the entire edge of the maxillary, gradually decreasing in size outward; four or five teeth in the outer series of the premaxillary, four in the inner; mandible with four large teeth in front, the third the largest, followed abruptly by about eight smaller teeth; second suborbital in contact with the preopercle below, a narrow naked area posterior; parietal fontanel twice as long as the frontal; dorsal and ventral profiles equally convex; predorsal area narrowly rounded, 18 scales in a median series.

Ten gill-rakers on the lower gill-arch, their length one half that of the gill-filament.

Origin of dorsal equidistant from the tip of the snout and the base of the caudal, its margin rounded; preventral region rounded, with a median series of 16 scales; pectorals scarcely reaching ventrals; ventrals reaching anal opening; anal rounded, the longest ray not reaching tip of last ray when depressed; the scales thin, paper-like, not rigid; the base of the caudal usually with a large abnormal scale above and below the median line and extending some distance upon the caudal rays; in some specimens the single scale is replaced by two smaller scales.

General body color dark brown above, light brown below; a dark lateral band continued to the tip of the middle caudal rays; dorsal with a black diagonal band; anal tipped with black; a black vertical humeral spot on the third to fifth vertical row of scales. In life metallic silvery; anal and caudal yellow.

## 5. HEMBRYCON COLOMBIANUS Eigenmann.

Plate 88, fig. 1.

*Hembrycon colombianus* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 8; Mem. Carnegie mus., 1922, 9, p. 153.

HABITAT.—Mountain streams of Santander, Colombia.

<sup>1</sup> 58 specimens, 33-95 mm., dried during shipment.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality
5470 C. Type	1	106	Rio San Gil, Santander, Colombia
13162 I. Paratype	1	106	Rio San Gil, Santander, Colombia
5471 C. { 13163 I. }	Paratypes 2	79	Rio Piedras, Santander, Colombia
5472 C. { 13164 I. }	Paratypes 2	63	Quebrada, Deoca Monte, Santander, Colombia
5473 C. { 13165 I. }	Paratypes 10	55	Quebrada, Mararari, Santander, Colombia

Head 4.33–4.5; depth 3.2–3.5; D. 10; A. 24 or 25; scales 8 or 9–47 to 53–7 or 8; eye equals snout, 3.5 in the head, 1.25–1.33 in interorbital; depth of caudal peduncle but little greater than its length, 1.66 in the length of the head.

Robust, not greatly compressed, ventral area rounded, prefrontal area without a distinct median series of scales; predorsal area rounded with about 17 rows of scales, not in a median series; interorbital convex, about one eighth in the distance between its base and the dorsal; parietal fontanel not quite twice as long as the frontal in the adult; second suborbital as wide as the eye, its margin very convex, in contact with the preopercle both below and behind; maxillary about as long as eye, not quite reaching the suture between the first and second suborbitals; maxillary-premaxillary border equal to snout and half the eye; four teeth in each row of the premaxillary, the outer series slightly curved; about seven heavy teeth occupying most of the edge of the maxillary, the anterior teeth tricuspid, the posterior triangular or conical; four large quinquedentate teeth in the mandible, the middle point much the heavier and larger; abruptly small ones on the sides.

Scales small, regularly arranged, the series not deflected toward the anal; numerous nearly parallel radials; an anal sheath of several series of teeth; base of caudal with large scales; a well-developed axillary scale; lateral line decurrent to the tenth scale, thence nearly straight.

Origin of the dorsal but little nearer the snout than the base of the caudal; its height a little less than the length of the head; adipose well developed; caudal lobes, including the scaled portion, about 3.5 in the head; anal low, its margin nearly straight, its origin under last dorsal ray, but little nearer opercle than caudal; ventrals small, not reaching anal by 1 to 3 scales; pectorals not reaching ventrals by 1 to 3 scales.



An obscure vertical humeral spot crossing the lateral line between the fourth to sixth scale; middle caudal rays dark.

Very largely described from the two largest specimens.

## 6. HEMIBRYCON BOQUIAE (Eigenmann).

Plate 76, figs. 2-5.

*Bryconamericus boquiae* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 20.

*Hemibrycon boquillae* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 153.

HABITAT.—Boquia at the western foot of Mt. Tolima, Colombia.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5059 C. Type	1	48 <sup>1</sup>	Boquia	Eigenmann
5059b C. Paratype	21		Boquia	Eigenmann
12831 I. Paratype			Boquia	Eigenmann

These specimens are in very bad condition. They belong to a species evidently closely related if not identical with *H. tolimae* or *H. dentatus*. They differ in having the anal rays ranging from 26-29; the mandibular teeth are quite different, the first three teeth are comparatively large and nearly uniform in size, the fourth is notably smaller and the rest suddenly minute.

These specimens are from the brook at Boquia and there will be no difficulty in determining their relationship if additional specimens are taken at the same place. They were associated with the similar *Bryconamericus caucanus*.

The teeth numbered three in the first row of six premaxillaries, four in twenty-two, five in eleven, six in one and two in one; they numbered four in the second row in thirty-seven, five in four and three in one. The maxillary teeth were  $\frac{2}{1} \frac{3}{1} \frac{4}{0} \frac{5}{2} \frac{6}{4} \frac{7}{8} \frac{8}{8} \frac{9}{9} \frac{10}{6} \frac{11}{2}$  where the upper figures represent the number of teeth and the lower the number of specimens possessing the given number.

## 7. HEMIBRYCON POLYODON (Günther).

*Tetragonapterus polyodon* GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 330 (Guayaquil); COPE, Proc. Amer. philos. soc., 1877, 17, p. 45; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 278; BOULENGER, Boll. Mus. univ. Torino, 1898, 13, p. 3 (Rio Santiago).

*Hemibrycon polyodon*, EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432; Mem. Carnegie mus., 1922, 9, p. 153.

HABITAT.—Coastal streams of Ecuador.

“Head 4.5; depth 3.5; D. 10; A. 27; scales 8-45-6; eye 3 in head, equal

<sup>1</sup> To base of caudal.

to interorbital; snout shorter than eye; upper profile from snout to dorsal gently curved; head compressed, interorbital convex; maxillary extending beyond front of eye; origin of dorsal midway between the snout and caudal, its hinder portion above the anterior anal rays; pectorals extending beyond base of ventrals. Silvery, the middle caudal rays black.  $3\frac{1}{2}$  inches." *Günther*.

It is more than probable that the types were shipped from Guayaquil but were collected at a considerable elevation in the interior of Ecuador or Peru. Mr. Henn did not find it in Ecuador. Likewise the identification of Boulenger's specimens from Santiago in northern Ecuador may be questioned. The identification of specimens in the British Museum, one from Carabaya, eastern Peru at an elevation of 3500 feet and three from Chulumani, Bolivia at an elevation of 4500 feet, may also be left in doubt for the present.

#### 8. HEMBRYCON HUAMBONICUS (Steindachner).

Plate 39, fig. 5.

*Tetragonapterus huambonicus* STEINDACHNER, Flussf. Südamer., 1882, 4, p. 28, pl. 5, fig. 1 (Callacate & Rio Huambo, Peru, 4,800–5,000 ft.); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 278.

*Hembrycon huambonicus* PEARSON, Indiana univ. studies, 1924, no. 64, p. 42 (Rio Colorado, Lower Bopi, Popoi River, Upper Beni, Tumupasa).

HABITAT.—Mountain streams of the eastern slope of Peru and the Beni Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
13753 l.	5	63–100	Rio Comerciato	Heller
— Field Mus.	1	88	Moyobamba	Osgood
16195 l.	Many	119 <sup>1</sup>	Huáncachupa Creek, Huánuco	Allen
16196 l.	Many	108 <sup>1</sup>	Rio Tingo, Huánuco	Allen
16198 l.	Many	110 <sup>1</sup>	Huallaga, Huánuco	Allen
16199 l.	Many	112 <sup>1</sup>	Rio Chinchao, Piedra Blanco	Allen
16120 l.			Below Cayamba Rapids	Allen
16121 l.		117 <sup>1</sup>	Rio Huallaga, Ambo	Allen
16122 l.	14	91 <sup>1</sup>	Chumatagna Creek, near Huallaga, above Cayamba Rapids	Allen
17318 l.	7	42–88	Rio Colorado, Lower Bopi	Pearson
17319 l.	20	48–98	Popoi River, Upper Beni	Pearson
17320 l.	30	28–57	Tumupasa	Pearson
17609 l.	2	62, 63	Paipay, Rio Crisnejas, Peru	Pearson
17610 l.	30	64–88	Balsas, Peru	Pearson

<sup>1</sup> Largest specimen.

"Head 4.25-4.33; depth 2.66-3; D. 10; A. 26-27; scales 7.5 or 8-42 to 43 (+3)-6 or 7; eye 3.33-3.75 in the head; snout 3; interorbital 2.6-3.

Mouth oblique; maxillary with strong teeth along its entire edge, reaching or not quite reaching to the third suborbital or middle of eye; interorbital convex in the young, flattened in the adult; origin of dorsal midway between snout and caudal or nearer the latter, its height .5-.66 of an ocular diameter shorter than the head; base of dorsal 2 in the head; pectoral reaching ventral in the male, as long or a little shorter in the female; ventral (in ♂ 107 mm.) reaching not quite to or a little beyond origin of anal; depth of caudal peduncle 2-3 in the depth; humeral spot crossing the 4th to 6th scale of the lateral line; a lateral band; caudal spot faint, sometimes reaching to end of the middle rays. 85-107 mm." *Steindachner*.

In the specimen from Moyobamba there is a large scale partly covered by a smaller one on the base of each caudal lobe; the maxillary teeth (eleven) are mostly 5-pointed.

#### 9. HEMBRYCON GUPPII (Regan).

Plate 2, fig. 3; Plate 39, fig. 6; Plate 76, fig. 1.

*Tetragonopterus guppui* REGAN, Proc. Zool. soc. London, 1906, p. 378 (Trinidad).

*Hembrycon guppui* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Trinidad.

Three specimens 11326 l. 57-107 mm. Trinidad. Guppy.

Head 4.5-4.75; depth 3.3-3.4; D. 10; A. 28-32; scales 7-38 or 40-5; eye 3-3.2; interorbital 2.6-2.9.

Elongate, depth at middle of pectoral about the same as at origin of dorsal from whence it tapers to the caudal peduncle; preventral area rounded, without a regular median series of scales; postventral area keeled; predorsal area narrowly rounded, without a regular median series of scales.

Occipital process about  $\frac{1}{2}$  in the distance from its base to the dorsal, bordered by 3 scales on the sides; skull smooth convex; frontal fontanel extending at least to above middle of eye, half as long as the parietal without the occipital groove; second suborbital in contact with the entire length of the lower limb of the preopercle, a narrow naked border behind it; maxillary slender, of nearly equal width, reaching to the end of the preorbital in the adult. Teeth in premaxillary and mandible 3- or rarely 4-pointed, the middle point much the more prominent; five teeth in the outer row of the premaxillary of which the anterior is slightly out of line, in advance of the others or else the second one is set back; four much

larger teeth in the second row, their anterior and posterior surfaces equally arched, the three points in a straight line, the teeth being 3-pointed incisors; teeth of the lower jaw similar, the front ones much larger than those of the inner teeth of the upper jaw, graduated to the fourth tooth which is of about the same size as the inner teeth of the upper jaw, teeth of the sides of the lower jaw small, but not abruptly so, mostly 3-pointed.

Gill-rakers slender, 8 + 12.

Scales cycloid, with numerous (up to 30) parallel striae in the adult, much fewer more diverging striae in the young; regularly imbricate except above and just in front of the anal where there are a few interpolated series; caudal naked; anal with a sheath of a single series of scales; a well-developed axillary scale; lateral line not greatly decurved, the row of scales below it parallel with it.

Dorsal a little nearer the snout than the caudal; origin of anal nearly under middle of dorsal; ventrals more than an orbital diameter in advance of the vertical from the origin of the dorsal; anal little emarginate; pectorals reaching ventrals, ventrals not to anal.

Humeral spot faint or absent; middle caudal rays black.

#### 10. HEMIBRYCON TAENIURUS (Gill).

Plate 39, fig. 2.

*Poeciliurichthys taeniurus* GILL, Ann. Lyc. nat. hist. N. Y., 1858, 6, p. 58 (Trinidad).

*Tetragonopterus taeniurus* LÜTKEN, Vidensk. medd. nat. for. Kjob., 1874, p. 233; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 276.

*Hemibrycon taeniurus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432; EIGENMANN, Indiana Univ. studies, 1920, no. 44, p. 11 (Concejo).

*Tetragonopterus (Hemibrycon) trinitatis* LÜTKEN, Vidensk. medd. nat. for. Kjob., 1874, p. 234; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53.

*Tetragonopterus trinitatis* ULREY, Ann. N. Y. acad. nat. sci., 1895, 8, p. 275.

HABITAT.—Trinidad.

According to the description of Regan this species differs from *H. guppii* only in the characters noted in the key.

After the above was written specimens were received from A. S. Pearse, Concejo, Rio Tuy, Venezuela (15138 I.) and Concejo, Rio Tiquirito, Venezuela (15139 I.).

#### 11. HEMIBRYCON JELSKII (Steindachner).

*Tetragonopterus jelskii* STEINDACHNER, Ichthol. beitr., 1875, 4, p. 40 (Monterico, Peru); Flussf. Südamer., 1882, 4, p. 25 (Huambo); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 281.

*Hemibrycon jelskii* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Central Peru, east slope, 2723 feet.

"Head 4.33–4.66; depth 2.33 ♀–3 ♂; D. 10; A. 29–35; scales  $7\frac{1}{2}$  to 9–39 to 40 (+3 or 4)–6 or  $6\frac{1}{2}$ ; eye 3.25–3.5 in head, 1 in snout; interorbital 3 in head.

Snout rounded, interorbital convex; maxillary reaching to or nearly to below middle of eye; teeth along its entire edge; profile depressed over the eyes in the young; pectorals about as long as head usually reaching beyond origin of ventrals; origin of ventrals nearer snout than caudal by the length of the head; origin of dorsal equidistant from tip of snout and base of caudal or a little nearer snout; dorsal equal to or a little greater than the head in the male, shorter in the female; caudal 3.66–3.75 in the length; depth of caudal peduncle 2.66–3 in the depth; scales with numerous radiae; humeral spot crossing the fourth to the seventh or eighth scales of the lateral line; caudal spot to end or middle of caudal rays." *Steindachner*.

The following specimens have been received recently: —

17640 I. 54, 30–40 mm. Rio Pusoc, above Balsas, Peru. Pearson.

## 12. HEMIBRYCON DARIENSIS Meek and Hildebrand.

*Hemibrycon dariensis* MEEK & HILDEBRAND, Field Mus. publication, 1916, no. 191, p. 285, pl. 20 (Rio Yape, Rio Tuyra Basin, Panama); EIGENMANN, Mem. Carnegie Mus., 1922, 9, p. 153.

HABITAT.—Rio Tuyra Basin, Panama.

Two specimens 15335 I. Paratypes. 59, 62 mm. Rio Yape. Meek & Hildebrand.

Allied to *H. jelskii*.

Head 3.45 to 4.5; depth 2.4 to 3.55; eye 2.6 to 3.25 in head; interorbital 2.8 to 3.15 in some; D. 9 or 10; anal 27 to 29, rarely 30; scales 8–38 to 41–6, 14 to 16 predorsal.

Maxillary .7 eye diameter, with six to ten teeth, similar to second premaxillary series, but larger, and abruptly smaller ones at sides. Premaxillary with the outer series of teeth irregular, last tooth on each side and the two anterior teeth placed further outward, the second series with eight larger teeth, each tooth with four or five cusps, one cusp enlarged.

Gill-rakers 10 on lower limb of first arch.

Dorsal origin midway between tip of snout and caudal base. Anal origin under posterior rays of dorsal. Ventrals scarcely reaching origin of anal, inserted an eye's diameter nearer to tip of snout than to base of last anal ray. Pectorals reaching to or slightly past ventral base.

A silvery lateral band. A black bar from caudal base to end of central caudal rays.

## 13. HEMIBRYCON DENTATUS (Eigenmann).

Plate 39, fig. 3; Plate 76, figs. 10, 12-14; Plate 80, figs. 3, 5, 7-11.

*Bryconamericus dentatus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 19.*Hemibrycon dentatus* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 153.

HABITAT.—Upper Cauca and ?Atlantic side of the Cordilleras east of Bogota.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5054 C. Type	1	98	Piedra Moler	Eigenmann
5054 bis C. } 12828 I. }	Paratypes 16	40-96	Piedra Moler	Eigenmann
5058 C. } 12827 I. }	Paratypes 20	40-118	Paila	Eigenmann
5074 C. } 12848 I. }	Paratypes 2	45, 90	Cauca at Cali	Eigenmann
5056 C.	1 <sup>1</sup>	42	Peñas Blancas	Eigenmann
5467 C. } 13159 I. }	4 <sup>2</sup>	59-85	Villavicencio	Gonzales

Head 4-4.5; depth 3.2-3.4; D. 10; A. 30-34; scales 7 or 8-45 to 48-5 or 6; eye 3 in head, equal to the interorbital or a little less; depth of caudal peduncle less than its length, two or less in the length of the head, 2.75-3 in the depth.

Compressed, slender, dorsal and ventral profiles equally and evenly curved; preventral area narrow, narrowly convex between the pectorals, no regular median series of scales; predorsal area with about 13 scales not in a regular series; occipital process about equal to one seventh of the distance from its base to the dorsal; bordered by 3 scales on each side; interorbital convex, smooth; snout pointed, the lower jaw slightly the shorter; second suborbital leaving a narrow naked border behind, its greatest width in the largest specimens three fourths as long as the eye; maxillary almost or quite reaching to the end of the first suborbital, equal to the eye in length; premaxillary-maxillary border without a distinct angle. Four teeth in the inner series of the premaxillary; outer row of premaxillary with four to six teeth, very variable in position, the first and last usually quite evident, in front of the lower lip when the mouth is

<sup>1</sup> The specimen from Peñas Blancas, 5056 C. has depth 3.66; A. 29; scales  $7\frac{1}{2}$ -41-5.

<sup>2</sup> These specimens from the Atlantic slope of the eastern Cordilleras, all in a rather poor state of preservation, may represent a distinct species. The head is shorter and the eye proportionately smaller. The eye in a specimen 85 mm. long measures 4.2 mm. In a specimen of *H. dentatus* from Paila 80 mm. long, it measures 5 mm. and in another 91 mm., it measures 5.4 mm.

Head 4.3-4.9; A. 29, 30, 33, 33; scales about 43.

Until better specimens are available for comparison these may be referred to *H. dentatus*.

closed; the first is quite prominent and well forward in the Piedra Moler specimens. Sometimes the teeth are in a curve, sometimes they are all in a straight line, sometimes alternate teeth are withdrawn from the line, sometimes the middle one is withdrawn, etc.; maxillary with from three to nine teeth, the anterior ones 3- to 5-pointed, the last one frequently remote from the others, conical; the teeth sometimes extending over half the margin of the maxillary, rarely over more than one half; mandible with five larger teeth in a series and about ten graduated ones on the side, the break between the fifth and sixth not very pronounced.

Gill-rakers 8 + 9.

Origin of dorsal equidistant from tip of snout and end of lateral line or nearer the snout, its margin subtruncate, its highest ray extending for a distance equal to about 2 scales beyond the tips of the penultimate, about equal to the length of the head; caudal lobes about  $3\frac{1}{2}$ –4 in the length; anal slightly emarginate, its origin under the middle of the dorsal or a little further forward; ventrals not reaching anal, their origin equidistant from tip of snout and last fourth of the anal; pectorals reaching origin of ventrals or a little beyond.

Scales thin, with about 10 radia; regularly imbricate, except over the anal where there are a few interpolated scales; lateral line much more sagging than in *B. tolímae*; caudal naked, the lobes with a basal sheath; anal with a variously developed sheath of a single series of scales; axillary scale short.

Middle caudal rays black; a large, faint shoulder band crossing the 3d to 5th scale of the lateral line. Silvery.

#### 14. HEMIBRYCON DECURRENS (Eigenmann).

Plate 39, fig. 1.

*Bryconamericus decurrens* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 20.

*Hemibrycon decurrens* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 153.

HABITAT.—The Dique, Colombia.

##### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5055 C. Type	1	57 <sup>1</sup>	Soplaviento	Eigenmann
12829 I. Paratypes		53 <sup>1</sup>	Soplaviento	Eigenmann

Evidently closely allied to *H. dentatus* from which it differs much in shape.

Head 4.33; depth 3; D. 10; A. 31–33; scales 9–44–6; eye 3 in the head; equal to the interorbital.

<sup>1</sup> To base of caudal.

Depth of caudal peduncle equal to its length; premaxillary with four or five teeth in the outer series, four in the inner; six teeth on the maxillary on half or a little less than half the margin of the maxillary. The last tooth is in the paratypes remote from the rest, mandibular teeth of the sides abruptly smaller.

Origin of dorsal equidistant from tip of snout and end of lateral line; origin of anal under anterior half of dorsal, its base 2.8-3 in the length; interpolated rows of scale beginning over the middle of the ventrals, the rows of scales distinctly decurvent to the anal. Otherwise as in *H. dentatus*.

#### 24 a. ACROBRYCON Eigenmann and Pearson.

*Acrobrycon* EIGENMANN & PEARSON, Indiana univ. studies, 1924, no. 64, p. 44.

TYPE.—*Tetragonopterus ipanquianus* Cope.

Closely allied to *Hemibrycon* differing in that the male has a large caudal pouch. In this respect it resembles *Argopleura*, which differs from *Bryconamericus* by the male possessing a caudal pouch. The scales are continued along the middle of the caudal much farther than above or below. Along the ventral edge of the caudal they are continued only half as far. The scales of the lower half of the caudal are attached to skin, which is free from the caudal rays it covers and which is pouched out away from the rays. Cheek entirely covered by the sub-orbital. Premaxillary with 2 rows of teeth, 4 in the inner row; maxillary with teeth along more than half its length.

HABITAT.—Eastern slopes of the Andes in Peru and Bolivia.

#### ACROBRYCON IPANQUIANUS (Cope).

Plate 69, figs. 1, 2; Plate 85, fig. 1.

*Tetragonopterus ipanquianus* COPE, Proc. Amer. philos. soc., 1877, **17**, p. 41 (Urubamba); 1878, **17**, p. 692;

EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 277.

*Astyanax ipanquianus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 337, fig. 25.

*Acrobrycon ipanquianus* EIGENMANN & PEARSON, Indiana univ. studies, 1924, no. 64, p. 44 (Espia, Bolivia).

HABITAT.—Eastern slopes of the Andes in Peru and Bolivia.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
21114 Type	1	97 <sup>1</sup>	Upper Urubamba	
16054 I.	2	91, 122	Urcos, Rio Urubamba	Eigenmann
10053 I.	—	132 <sup>2</sup>	Lake Huatana	Eigenmann
16056 I.	1	79	Rio Urubamba at Urubamba	Eigenmann

<sup>1</sup> To base of caudal.

<sup>2</sup> Largest specimen.



Catalogue number	Number of specimens	Size in mm.	Locality	Collector
15076 L.	Many	118 <sup>1</sup>	Allantaitambo	Eigenmann
16055 L.	Many	133 <sup>1</sup>	Toronto	Eigenmann
16193 L.	Many	22 <sup>1</sup>	San Miguel Bridge	Eigenmann
17305 L.	3	72-114	Espia	Pearson

Head 4.66; depth 3.5; D. 10; A. 32; eye 3.25; interorbital 2.4.

Elongate, slender; predorsal and preventral area rounded or the former obscurely keeled; about 23 scales in front of the dorsal, not forming a median series.

Occipital process about  $\frac{1}{11}$  of the distance of its base from the dorsal; interorbital rounded; frontal fontanel not much shorter than the parietal without the occipital groove; the frontals entirely separated from each other by the fontanel and the ethmoid; first and second suborbital covering the entire cheek below and in front; a naked area behind the second suborbital; maxillary slightly longer than the eye, with eight or nine teeth, the upper ones tricuspid, the lower one or ones conical; four or five teeth in the outer series of the premaxillary; four in the inner; dentary with four graduate tricuspid teeth and about eight tricuspid or conical teeth on the side.

Gill-rakers 8 + 12.

Scales cycloid, their margins much convex, with numerous nearly parallel striae; lateral line but little decurved.

Origin of dorsal a little nearer caudal than tip of snout, its height about  $4\frac{1}{2}$  in the length; origin of anal under last dorsal ray; anal emarginate; origin of ventrals more than an orbital diameter in front of the vertical from the dorsal, nearly reaching anal; pectorals reaching about two thirds to ventrals.

Silvery; middle caudal rays black; humeral spot obscure large, vertical.

[This description is based entirely on the Type, 21114 Acad. nat. sci. Phil. G. S. Myers].

## 25. CREAGRUTUS Günther.

*κρεαγρευτος*, tearing off the flesh.

*Creagrus* GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 339.

TYPE.—*Creagrus mülleri* Günther.

Small fishes (85 mm.) differing from *Astyanax* and *Bryconamericus* in the character of the mouth and anal. The anal, with 11-16 rays, is shorter than in any other genus of the Tetragonopterinae except *Microgenys* and *Bryconamericus*; the mouth narrow; premaxillary with three irregular series of teeth. Maxil-

<sup>1</sup> Largest specimen.

lary with a few teeth, short; mandible very short and heavy, included; the lower lip thick; the teeth of the lower jaw few, heavy, directed backward when the jaw is closed. Second suborbital various, sometimes covering the entire cheek.

HABITAT.—Rio Tocantins, Guiana, Colombia, Peru, Panama, and Bolivia. Reaching its maximum development along the base of the Andes of northern Peru and Colombia.

### *Key to the Species.*

- a. Premaxillary with an inner series of four or five teeth; five teeth alternating form an outer series of three teeth and a middle series of two teeth.
  - b. Anal 11; eye 2.6 in the head; suborbitals leaving a narrow naked margin; a silvery lateral band and conspicuous curved dark bar behind the shoulder; scales about 6-36-2.5; depth 4.33.
    1. *melanzonus* Eigenmann.
  - bb. Anal 12; eye 3 to 3.66 in the head; suborbital bones leaving almost half of the cheeks uncovered; anterior edge of anal and outer edge of ventrals white; caudal, dorsal, and anal with more numerous chromatophores than the pectoral and ventral; humeral spot and lateral band faded; scales 4.5-38 to 40-3; depth 3-3.5; head 4.....2. *peruanus* (Steindachner).
  - bbb. Anal 14; eye 4 in head; suborbital as wide as eye; touching the lower preopercular limb but not the angle; a more or less distinct blackish band runs from a black humeral spot to the middle of the root of the caudal fin; scales 5-39-3; depth 3.33; head 4.....3. *mülleri* (Günther).
- aa. Premaxillary with an inner series of three or four teeth; a series of four or five teeth extending obliquely from the third of the inner series to the foremost tooth; a tooth lateral to the fourth tooth of this series from in front, another tooth in the angle between the inner series and the oblique outer series.
  - c. Pores of the lateral line alike, normal.
    - d. Second suborbital variable, usually not as wide as eye except in the very old, leaving a variable naked area below; A. 11-13; scales 4-35 to 40-3; a conspicuous humeral bar.
      4. *beni* Eigenmann.
    - dd. Second suborbital not as wide as eye; A. 14; scales 4-32-3; a small vertically oval humeral spot; a dusky spot at base of middle caudal rays.....5. *anary* Fowler.
    - ddd. Second suborbital as wide as eye or nearly as wide, in contact with the preopercle below, leaving a naked area behind.
      - e. A. 10 to 11; depth about 3.5; lateral line 36-38; eye a little greater than snout; caudal peduncle more than 2 in the head.....6. *brevipinnis* Eigenmann.
      - ce. A. 11 or 13, very rarely 10 or 14; lateral line 33-36; depth 2.75-3.25; depth of caudal peduncle 1.6-2 in the head.....7. *magdalenae* Eigenmann.
      - cee. A. most frequently 14, rarely 15, more rarely 12; lateral line 33-36; depth 3.1-3.6; depth of caudal peduncle 2 in head.....8. *affinis* Steindachner.
      - cccc. A. 15 or 16; lateral line 35; depth 3.3-3.4.....9. *simus* Meek & Hildebrand.
    - cc. Pores of the posterior part of the lateral line broad, slit-like, covered by a scale-like flap; first tooth of the premaxillary placed well in advance of the rest, the median toothless space of the premaxillary bordered by four teeth on each side; A. 13-15; lateral line 39-40.
      10. *caucanus* Eigenmann.

### 1. *CREAGRUTUS MELANZONUS* Eigenmann.

#### Plate 34, fig. 2.

*Creagrutus melanzonus* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 30; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 435; Mem. Carnegie mus., 1912, 5, p. 317, pl. 45, fig. 1 (Crab Falls, Warraputa, Tumatumari).

HABITAT.—Middle Essequibo Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1067 C. Type	1	44	Crab Falls, Essequibo River	Eigenmann
1068 C. } 11753 }	Paratypes 2	27	Warraputa, Essequibo River	Eigenmann
1069 C. } 11754 }	Paratypes 3	25-38 about	Tumatumari, Potaro River	Eigenmann

Head 4; depth  $4\frac{1}{3}$ ; D. 10; A. 11; scales 6-36-2.5; eye 2.6; interorbital 3.5.

Elongate, heaviest above middle of pectoral, the width about  $\frac{1}{2}$  the depth; preventral area broadly rounded, postventral rounded; predorsal area broad, with an obscure keel; a median series of about 10 scales.

Occipital process very short, about  $\frac{1}{4}$  of the distance of its base from the dorsal; skull smooth but slightly convex; frontal fontanel triangular, nearly as long as the parietal; snout rounded, projecting beyond the lower jaw; cheeks long and low, the second suborbital about twice as long as broad, its convex margin leaving a considerable naked area except at a point of contact with the lower limb of the opercle.

Maxillary-premaxillary border forming a simple, concave curve; horizontal extent of the premaxillary about equal to the length of the maxillary which is equal to half the length of the eye. Nine teeth in each premaxillary, those in the maxillary (4) similar and continuous with the last of the premaxillary teeth; outer teeth of the premaxillary conical, inner tricuspid, the second and third of the original outer series forming the second row; about seven tricuspid teeth in the dentary of which the first three are large, the rest minute; tips of all the teeth except of the maxillary and of the sides of the lower jaw brown. Lower jaw short, less than length of eye.

Gill-rakers 4 + 10.

Scales very thin; anal sheath none; caudal lobes naked, except for a few large scales on the lower lobe; axillary scale well developed.

Origin of dorsal in advance of the middle; origin of ventral in advance of that of the dorsal; origin of anal behind the last ray of the dorsal; adipose slightly behind base of last anal ray; ventrals not reaching anal; pectorals not nearly to ventrals.

Straw colored, a bright silvery band; first suborbital, cheeks and opercle behind eye, snout and upper part of head, dotted. A continuous curved band crossing 3d and 4th scales of the lateral line; scales of back with one to several series of dots on margin; silvery lateral band underlaid with a dotted stripe, a

small caudal spot at the base of the middle rays; a pair of rows of dots from the anus along the sides of the anal, a single series of dots behind the anal.

[This species is very probably not a true *Creagrutus*, but a member of a new genus in which the teeth are in three rows in the young, reduced to two in the adult. The types of *C. melanzonus* seem to be young.—*G. S. Myers*].

## 2. *CREAGRUTUS PERUANUS* (Steindachner).

Plate 35, figs. 4, 5.

*Piabina peruana* STEINDACHNER, Ichthyol. beitr., 1875, 4, p. 46 (Monterico).

*Creagrutus peruanus* STEINDACHNER, Ichthyol. beitr., 1878, 6, p. 6; Flussf. Südamer., 1882, 4, p. 25 (Huambo); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 56; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 435.

*Creagrutus nasutus* GÜNTHER, Ann. mag. nat. hist., 1876, ser. 4, 17, p. 400 (Monterico, Peru).

HABITAT.—Eastern slope of Peru.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
—— Brit. mus. Type	1	—	Monterico	Taczanowski
—— Brit. mus.	Several		Monterico	Taczanowski
——	2	45, 53	Santa Ana	Heller
13759 I.	27	45–85	Rio Comerciato	Heller

"B. 4. D. 10. A. 13. V. 8. L. lat. 39. L. trans.  $4\frac{1}{2}$ /l.

The height of the body is contained thrice and one third in the total length (without caudal), the length of the head four times. Snout convex, less obtuse than in *C. mülleri*, equal to the diameter of the eye, which is one fourth of the length of the head. Interorbital space rather flat, its width being more than the diameter of the eye. The lower infraorbital is not nearly so broad as in *C. mülleri*, leaving a large portion of the cheek before the angle uncovered, and not reaching the lower preopercular limb. Teeth as in *C. mülleri*. The dorsal fin commences a little nearer to the snout than to the root of the caudal fin, and a little before the vertical from that of the ventral. Caudal fin forked. Anal commencing behind the dorsal. Pectoral as long as the head without snout, and extending to the ventral. Ventral shorter than pectoral, reaching to vent. Sides and belly silvery. A more or less distinct shining band runs from a black humeral spot to the middle of the root of the caudal fin."

"Monterico, Peru. Several specimens sent by Professor Taczanowski, 4 inches long." *Günther*.

In the Heller specimens the A. 12; scales  $\frac{38}{2}$ ,  $\frac{46}{1}$ ,  $\frac{43}{1}$ ; third suborbital in largest covering not more than half the cheek.

## 3. *CREAGRUTUS MÜLLERI* (Günther).

Plate 35, figs. 6, 7.

*Leporinus mülleri* GÜNTHER, Proc. Zool. soc. London, 1859, p. 92 (Andes of western Ecuador).

*Creagrutus mülleri* GÜNTHER, Cat. fishes Brit. mus., 1861, 5, p. 339; STEINDACHNER, Ichthyol. beitr., 1882, 12, p. 20 (Candós, Ecuador); BOULENGER, Proc. Zool. soc. London, 1887, p. 281; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 56; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 435.

HABITAT.— Eastern slope of Ecuador.

I have examined the type Plate 35, figs. 6 & 7.

"B. 4. D. 11. A. 14. V. 8. L. lat. 39. L. transv.  $\frac{5}{3}$ . Vert.  $\frac{18}{11}$ ."

This fish has externally the appearance of a *Leucisus*. The height of its body is contained thrice and one-third in the total length, the caudal fin not included; the length of the head four times. The snout is rather short and obtusely convex, not longer than the diameter of the eye, which is one-fourth of the length of the head. Interorbital space entirely osseous, rather convex, its width being more than the diameter of the eye; the lower infraorbital is much dilated, as wide as the eye, and touches the lower preopercular limb, but not the angle. The front series of intermaxillary teeth is composed of three pairs of small subconical teeth, the second series of two pairs, and the hinder series of four pairs; the latter are the largest, and provided with two or three points. Mandible with three pairs of strong front teeth, and with some small ones on the sides. The dorsal fin commences a little nearer to the snout than to the root of the caudal fin, above or immediately behind the root of the inner ventral ray. Caudal fin distinctly emarginate. Anal commencing behind the dorsal. Pectoral as long as the head without snout, extending to the ventral. Ventral shorter than pectoral, reaching to the vent. Back brownish. Sides and belly silvery. A more or less distinct blackish band runs from a black humeral spot to the middle of the root of the caudal fin." *Günther*.

#### 4. *CREAGRUTUS BENI* Eigenmann.

Plate 58, fig. 3; Plate 93, fig. 4, 5, 7.

*Creagrutus beni* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 172; Indiana univ. studies, 1920, no. 44, p. 12; Mem. Carnegie mus., 1922, 9, p. 238; PEARSON, Indiana univ. studies, 1924, no. 64, p. 45 (Rio Beni Basin).

HABITAT.— Rio Tocantins, Rio Beni and along base of Cordilleras east of Bogota; also on western slope of Andes near Colombia and Venezuela near Lake Valencia.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3216 C. Type	1	53	Villa Bella, Rio Beni, Bolivia	Haseman
2968 C.	1	41 <sup>1, 2</sup>	Caehoeira de Valpa de Rio Nova near Piabana, Tocantins	Haseman
5480 C. } 13173 I. }	3	78-84	Rio San Gil, Santander, western slope of eastern Andes	Gonzales
5481 C. } 13174 I. }	6	54-80	Rio Guadrigna	Gonzales
5482 C. } 13175 I. }	18	47-84	Rio Negro, Villavicencio	Gonzales
5488 C.	—		Rio Rontador	Gonzales
13179 I.	—		Rio Rontador	Gonzales
13372 I.	12	54-73	Inebrada Cramalote, Villavicencio	Gonzales

<sup>1</sup> This specimen is small and I am not certain of the identification.

<sup>2</sup> [Numerous specimens from the headwaters of the Tocantins, differ from *C. beni*, in that the humeral spot is not a vertical bar, but a more or less diffuse blotch, and in that the suborbital covers nearly or wholly the entire cheek. They are larger than *C. beni* and probably represent a distinct race. *G. S. Myers*].

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
13373 I.	—	48-80	Barrigon, Rio Meta	Gonzales
13722 I.	2		Rio Abirregas, Merida	Rosenbaum
15124 I.	—		Rio Guaire near Caracas	Pearse
15125 I.	—		El Concejo, Rio Tiquirito	Pearse
15133 I.	—		Maracay, Rio Bue	Pearse
15134 I.	—		Isla del Buro	Pearse
17310 I.	64	38-75	Tumupasa	Pearson
17311 I.	55	30-83	Popoi River, Upper Beni	Pearson
17312 I.	31	34-82	Rio Colorado, Lower Bopi	Pearson
17313 I.	29	33-83	Rio Iniqui, Upper Beni	Pearson
17314 I.	1	58	Rurrenabague, Upper Beni	Pearson
17315 I.	2	44, 51	Ixiamas	Pearson
17316 I.	2	62, 64	Huachi	Pearson
17600 I.	29	43-74	Balsas, Peru	Pearson
17601 I.	12	31-70	Tingo de Pauca, Marañon River	Pearson
17602 I.	83	28-56	Paipay, Rio Crisnejas, Peru	Pearson

Head 4-4.33; depth 3.25-3.5; D. 10; A. 11-13; scales 4-35 to 40-3; eye 3 in head; interorbital equals eye.

Subcylindrical; predorsal area rounded, with a median series of 8 scales; ventral area round, without a distinct median series of scales.

Occipital process very short, bordered by  $1\frac{1}{2}$  scales on each side; cheeks narrower than eye except in old; second suborbital sometimes in contact with the preopercle below but never behind and in front; snout and maxillary about equal to eye or longer; lower jaw distinctly shorter. Maxillary with three graduate teeth, premaxillary with an outer row of five triangular or tricuspid teeth, the second, third and fourth more and more withdrawn so that the fourth is between the fifth of the outer series and the second of the inner series.

Gill-rakers slender, 9 + 12.

Anal sheaths very small; base of each caudal lobe with a few scales.

Origin of dorsal equidistant from tip of adipose and tip of snout, or a little nearer the former. Origin of anal behind the vertical from the last dorsal ray. Ventrals not reaching anal; pectorals not to the ventrals.

Straw colored; a faint silvery band; sides with increasing number of chromatophores from the lateral line upward, very few below the lateral line; a conspicuous humeral bar crossing the 3d and 4th scales of the lateral line. No caudal spot.

An examination of the specimens from Villavicencio and Barrigon shows a variation in the anal rays and in the lateral line to be as follows:  $\frac{\text{rays}}{\text{specimens}} = \frac{11}{20}$ ,  $\frac{12}{15}$ ,  $\frac{13}{13}$ ,  $\frac{\text{scales}}{\text{specimens}} = \frac{35}{11}$ ,  $\frac{36}{6}$ ,  $\frac{37}{11}$ ,  $\frac{38}{13}$ ,  $\frac{39}{9}$ ,  $\frac{40}{5}$ , and a variation in the degree of armature

from a large naked border in 20, a narrow naked border in 15 and the second sub-orbital in contact with the horizontal limb of the preopercle in 12. An attempted analysis of these figures shows that the variation in the anal rays, lateral line and degree of armature of the cheek are correlated. Those with a small number of anal rays (11) are more likely to have a large portion of the cheek naked than those with the larger number of anal rays. Thus of the twenty specimens with eleven anal rays all have the cheeks widely naked and the mode of the anal is 38, whereas the specimens with the anal twelve or thirteen have the cheeks more widely covered and the mode of the anal rays is 39.

This is the most widely distributed species of the genus.

### 5. *CREAGRUTUS ANARY* Fowler.

*Creagrutus anary* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 552, fig. 16 (Madeira River about 200 miles east of Long. W. 62° 20').

HABITAT.—Madeira River.

This species (locally the "Anary") is known only from the types, two specimens 42 mm. long.

Head 3.5–3.75; depth 3.66–3.75; D. 10 or 11; A. 14; scales 5–40 to 42–3; snout  $3\frac{1}{8}$ –3.66; eye  $2\frac{7}{8}$ –3; interorbital 3 in the head.

Predorsal scales 8 or 9 in number. Origin of dorsal about midway between tip of snout and hind edge of adipose; a vertical dusky humeral spot above the 3d scale of the lateral line. A small dusky spot at bases of median caudal rays.

### 6. *CREAGRUTUS BREVIPINNIS* Eigenmann.

Plate 34, fig. 1.

*Creagrutus brevipinnis*, EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 10; Mem. Carnegie mus., 1922, 9, p. 146.

HABITAT.—Upper Cauca.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4887a C. Type	1	61	Piedra Moler	Eigenmann
12730 I. Paratypes	15	57 <sup>1</sup>	Paila	Eigenmann
4889 C. } Paratypes	60	66 <sup>1</sup>	Paila	Eigenmann
12728 I. }			Piedra Moler	
4888 C. } Paratypes	29	55 <sup>1</sup>	Cartago	Eigenmann
12729 I. }				

<sup>1</sup> Largest specimen.

Closely related to *C. magdalenae* and distinguished from the other species of this genus in Colombia by the small number of anal rays and by the shape.

Head 4; depth 3.4–3.6; D. 10; A. 10 or 11 (most frequently 11); scales 4–36 to 38 (rarely 35)–2.5; eye .8–1 in snout, 2.8–3 in head, .8 in interorbital; depth of caudal peduncle, 2+ in its length, 2.2–2.5 in the head.

Heaviest below the front of the dorsal, caudal peduncle slender; second suborbital in contact with the preopercle below, its greatest width distinctly less than the diameter of the eye, the naked portion of the cheek about one third as wide as the suborbital.

Dorsal emarginate, the highest ray reaching to tip of last ray; anal very similar to the dorsal, the highest ray reaching to or nearly to tip of last.

Silvery; a dark humeral bar.

#### 7. *CREAGRUTUS MAGDALENAE* Eigenmann.

Plate 34, fig. 4; Plate 80, figs. 12–16.

*Creagrutus magdalenae* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 8; Mem. Carnegie mus., 1922, 9, p. 146.

HABITAT.—Middle Magdalena Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4880 C. Type	1	78	Girardot	Eigenmann
4881 C. { 12722 I. { Paratypes	100+	83 <sup>1</sup>	Girardot	Eigenmann
4884 C. { 12725 I. {	15	—	Honda	Eigenmann
4885 C. { 12726 I. {	—	51 <sup>1</sup>	Peñas Blancas	Eigenmann
5487 C. { 13178 I. {	30		Alban, Quebrada	Gonzales

More than 100 specimens<sup>2</sup> 4883 a–j C. and 12734 I., Apulo, Gonzales are most probably *C. magdalenae*.

Head 4; depth 2.75–3.25 (rarely in small ones 3.5); D. 10; A. 11–13;<sup>3</sup> scales 4–33 to 37–3;<sup>4</sup> depth of caudal peduncle 1.6–2 in the head, 1.5–1.7 in its length; eye equals snout, 3.5 in head, 1.25 in interorbital in largest, .6 in snout, 2.5 in head, .8 in interorbital in a small one.

<sup>1</sup> Largest.

<sup>2</sup> A.  $\frac{11}{9}$ ,  $\frac{12}{4}$ ; lateral line  $\frac{34}{3}$ ,  $\frac{35}{3}$ ,  $\frac{36}{5}$ .

<sup>3</sup>  $\frac{10}{1}$ ,  $\frac{11}{5}$ ,  $\frac{12}{1}$ ,  $\frac{13}{1}$ ,  $\frac{14}{1}$ .

<sup>4</sup>  $\frac{33}{1}$ ,  $\frac{34}{1}$ ,  $\frac{35}{10}$ ,  $\frac{36}{6}$ ,  $\frac{37}{2}$ .



Adult greatly compressed, subrhomboidal; preventral area broad, post-ventral bluntly keeled; predorsal area with 9 or 10 scales. Frontal fontanel much smaller than parietal; angle of second suborbital an orbital diameter from eye in the adult, slightly narrower in the smaller; naked strip behind the second suborbital about one third as wide as the suborbital. Maxillary-premaxillary border a simple curve slightly longer than the eye, the horizontal part of the premaxillary about as long as the maxillary. Two or three teeth on the maxillary; mandible with three large teeth, and one or two small ones on the sides.

Gill-rakers about 6 + 10.

Scales on the sides forming a sheath for the anterior part of the anal; caudal lobes sealed for about one third of their length. Lateral line tubes and pores simple; dorsal slightly emarginate, its highest ray reaching near tip of last, its origin considerably in advance of the middle; anal short, emarginate, its highest ray reaching to or nearly to the tip of the last, its origin equidistant from end of lateral line and opercle. Ventrals reaching to or nearly to the anal, pectorals to or nearly to the ventrals.

A silvery band, a dark humeral bar; back dusky.

#### 7a. CREAGRUTUS MAGDALENÆ var. ?

*Creagrutus magdalenæ* var.? EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 9.

The following specimens from the Magdalena Basin have the number of anal rays of *C. affinis* and the shape of *C. magdalenæ*.

4882 C., 12723 I, over 1000. Bernal Creek near Honda.<sup>1</sup> Eigenmann.

4886 C. 12727 I, over 40, largest 54 mm. Soplaviento.<sup>2</sup> Eigenmann.

#### 8. CREAGRUTUS AFFINIS Steindachner.

Plate 34, fig. 3; Plate 97, fig. 13.

*Creagrutus affinis* STEINDACHNER, Denks. K. akad. wiss. Wien, 1880, 42, p. 27 (Cauca, near Caceres); EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 7.

*Creagrutus notropoides* MEEK & HILDEBRAND, Field mus. Publication, 1912, no. 158, p. 68 (Chagres); 1916, no. 191, p. 289; EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 146.

*Creagrutus leuciscus* REGAN, Ann. mag. nat. hist., 1913, ser. 8, 12, p. 463 (Rio Lisa, Rio Condoto).

HABITAT.— Cauca, Atrato, San Juan, and Chagres.

Steindachner, whose specimens came from near Caceres on the Cauca, gives the following facts concerning *C. affinis*:—

<sup>1</sup> Of eleven selected without definite purpose two have 14 anal rays, nine 13; two have 35 pores in the lateral line, and nine 36.

<sup>2</sup> The anal rays in fourteen specimens are  $\frac{1}{3}$ ,  $\frac{1}{6}$ ,  $\frac{1}{1}$ ; the lateral line contains  $\frac{3}{1}$ ,  $\frac{3}{6}$ ,  $\frac{3}{4}$ ,  $\frac{3}{1}$  scales in fifteen specimens.

The largest specimen is 45 mm. long.

D. 10; A. 14; V. 8; L. lat. 36-37.

Head  $3\frac{5}{6}$ ; depth 3.5+; eye 2.4-2.5; interorbital 3.6; snout 4 in the head. Pectoral as long as head without snout, reaching ventrals.

This description excludes the specimens taken in the Upper Cauca, *C. brevipinnis* having but 10-12 anal rays and *C. caucanus* having a smaller eye and the scales 39 to 41. Of the remaining material collected in Colombia, some of the specimens collected in Soplaviento, Bernal Creek, the Atrato, and the San Juan agree in the number of anal rays and scales. Of these, those from the San Juan-Atrato basin agree more closely in the size of the eye and in the depth, and it is to these that the name *C. affinis* should be properly applied. I collected no material in the Lower Cauca from which the types of the species came.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5439 C. } 11128 L. }	Many	72 <sup>1</sup>	Certegui, Atrato Basin	Wilson
5440 C. } 11129 L. }	12	65 <sup>1</sup>	Tambo, Atrato Basin	Wilson
5441 C. } 11130 L. }	5	47 <sup>1</sup>	Managru, Atrato Basin	Wilson
5442 C. } 11131 L. }	5	48 <sup>1</sup>	Truando, Atrato Basin	Wilson
5443 } 11132 }	24	58 <sup>1</sup>	Raspadura, Atrato Basin	Wilson
5444 C. } 11133 L. }	2	66 <sup>1</sup>	Condoto, San Juan Basin	Wilson
11134 L.	1	65	Tado, San Juan Basin	Wilson
4890 C. } 12731 L. }	8	79 <sup>1</sup>	Puerto Negria, Rio San Juan	Wilson
4891 C. } 12732 L. }	4	80 <sup>1</sup>	Between Puerto Negria & Istmina, Rio San Juan	Eigenmann
4892 C. } 12733 L. }	100+	85 <sup>1</sup>	Istmina, Rio San Juan	Eigenmann
4893 C. } 12734 L. }	100+	51 <sup>1</sup>	Boca de Raspadura	Eigenmann
4894 C. } 12735 L. }	43	65 <sup>1</sup>	Quibdo, Atrato Basin	Eigenmann
—	—	—	Teffé, Brazil	Louis Agassiz

<sup>1</sup> Largest specimen.

The specimens enumerated above are certainly very closely related to if not identical with the *C. notropoides* of which Dr. Meek kindly lent me two specimens. The principal part of the following description is based on Istmina specimens where the species reaches its maximum size.

Head 4; depth 3.1–3.6; D. 10; A. 13–15, most often 14; scales 4–33 to 36, most often 34 or 35; eye a little longer than snout, 3 in head about equal to the interorbital, a little larger in specimens from other places.

Body and especially caudal peduncle compressed; heaviest below origin of dorsal; profile nearly straight over the head and nape, slightly convex toward dorsal, snout bluntish; preventral area broad; predorsal area with 8 to 10 scales; depth of caudal peduncle about half the length of the head, a little over half its own length. Frontal fontanel much smaller than the parietal; the head convex; second suborbital a little less than diameter of eye; naked area behind the second suborbital one fourth to one half as wide as the suborbital; premaxillary-maxillary border a simple curve, about as long as the eye; the horizontal extent of the premaxillary about as long as the maxillary. First two teeth of the premaxillary just in front of the lower lip, (for the arrangement of the premaxillary teeth see figures). The position of the first tooth in the types of *C. notropoides* is considerably different from that in the rest of the specimens. In the types of *C. notropoides* it is forward and medial, in the rest of the specimens it is mostly forward approaching the condition in *C. caucanus*. Maxillary with one to three teeth; mandible with four teeth, of which one is quite small, lateral.

Gill-rakers about 6 + 10.

Scales of the sides forming a sheath at the anterior part of the anal. Base of caudal lobes sealed; a large axillary scale; lateral pores simple.

Origin of dorsal in front of the middle, its highest ray reaching to near end of last; anal emarginate, the highest rays not reaching tip of last; ventrals reaching to or not quite to the anal; pectoral to or not quite to the ventrals.

A silvery lateral band; a humeral bar.

[Since the above was written, Meek and Hildebrand re-examined their material and considered *C. notropoides* distinct. Cf. Field mus. Publication, 1916, no. 191, p. 289. G. S. Myers].

## 9. CREAGRUTUS SIMUS Meek and Hildebrand.

*Creagrutus simus* MEEK & HILDEBRAND, Field mus. Publication, 1913, no. 166, p. 85 (Rio Cupe, Cituro Panama); 1916, no. 191, p. 290.

HABITAT.—Tuyra Basin, southern Panama.

This species is said to differ from *C. notropoides* in being less robust, more compressed, and in having a slightly larger eye.

"Head 3.6 to 3.8; depth 3.3 to 3.4; D. I, 8 or 9; A. II, 13 or 14; scales 5.5-35-4.5.

Body elongate, moderately robust; snout blunt, the lower jaw the shorter; eye 2.5 to 2.6 in head; snout 3.4 to 3.7; cheek about 3.1; maxillary nearly to middle of eye, its length 2.5 to 2.7 in head; gill-rakers 5+9; dorsal over or slightly behind ventrals, its origin nearer posterior end of adipose fin than tip of snout; anal short, its base 5.5 to 5.8 in body; pectorals 1.3 in head; ventrals 1.6; least depth of caudal peduncles 2.0 to 2.3 in head.

Color olivaceous, sides with broad silvery band; a humeral spot; no caudal spot." *Meek & Hildebrand*.

[Since the above account was prepared, Dr. Eigenmann has doubted the distinctness of *C. simus*. Cf. Mem. Carnegie mus., 1922, 9, p. 146, and footnote 13. *G. S. Myers*].

#### 10. CREAGRUTUS CAUCANUS Eigenmann.

Plate 34, fig. 5.

*Creagrutus caucanus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 9; Mem. Carnegie mus., 1922, 9, p. 147.

HABITAT.—Upper Cauca.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4895 C Type	1 {	113 <sup>1</sup>	Paila	Eigenmann
12738 I Paratypes	25 }			
4896 C {	40	83 <sup>1</sup>	Cali, Cauca	Eigenmann
12736 I }				
4897 C	1	64 {	Cartago	Eigenmann
12737 I	1	84 }		
4898 C	2	33, 50	Cali	Eigenmann

Head 4-4.33; depth 3.5-3.75; D. 10; A. usually 14 sometimes 15 or 13, rarely 12; scales 4-39 to 41-3; eye in largest specimens equals snout, 3.5 in the head, 1.33 in the interorbital; in the smaller it is equal to the interorbital, 3 in the head.

Heaviest above middle of pectoral, tapering to a slender caudal peduncle whose depth is one half its length or one half the length of the head. Profile regularly arched to the dorsal; preventral area broad, rounded; predorsal area with nine or ten scales; head smooth, convex in cross-section; occipital process short and pointed, about one sixth of the distance of its base from the dorsal;

<sup>1</sup> Largest specimen.



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VOL. XLIII. PART 5.

# THE AMERICAN CHARACIDAE.

BY

CARL H. EIGENMANN AND GEORGE S. MYERS.

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WITH ELEVEN PLATES

AND

SUPPLEMENT, INDEX, CONTENTS.

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CAMBRIDGE, U. S. A.:

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frontal fontanel much smaller than the parietal; angle of second suborbital an orbital diameter from the eye; the naked area behind the second suborbital .4 as wide as the suborbital. Snout pointed, in contact with the preopercle along its entire margin below. The premaxillary-maxillary border a simple curve, horizontal extent of the premaxillary much shorter than the maxillary, which equals the eye; lower jaw included, the first two teeth of the premaxillary considerably in front of the margin of the lower jaw. Maxillary with two or three many-pointed teeth; lower jaw short, with three heavy teeth in front and two graduated smaller ones on the side. Lower lip very thick.

Gill-rakers 5 + 10.

No scales on the anal, a sheath along its anterior half formed by the edges of the sides; caudal lobes scaled a short distance; pores for a variable distance from behind broad, covered by a free flap of the lateral line scale. This flap has the appearance of an accessory scale and distinguishes the species. A large axillary scale.

Dorsal slightly emarginate or truncate, its highest ray about reaching tip of last, its origin nearer snout than caudal by one or two diameters of the eye. Anal emarginate, its highest ray reaching to base of the penultimate ray or to the second fourth of the last. Ventrals reaching to or nearly to the anal, pectorals to or nearly to the ventrals.

A bright silvery lateral band; a large humeral bar; back dusky.

## 26. PIABINA Reinhardt.

Piabinha, a diminutive of Piaba, a local name for small Characins in Lagoa Santa, Brazil.

*Piabina* REINHARDT, Overs. Dansk. vid. selsk. forh., 1866, p. 50.

TYPE.—*Piabina argentea* Reinhardt.

The genus *Piabarchus* has been separated from *Piabina* and immediately follows it.

This genus differs from *Creagrutus* in the length of the anal, having 20 or more rays. There being but few species in this subfamily with so few anal rays as *Creagrutus*, this may be made use of for a generic character.

HABITAT.—Rio das Velhas, Upper Paraná, and the Rio Beni.

### *Key to the Species.*

- a. Premaxillary bones less angular, space between outer and inner rows of teeth less.
  - 1. *argentea* Reinhardt.
- aa. Premaxillary bones more angular, a greater space between first and third rows of teeth.
  - 2. *beni* Pearson.

1. *PIABINA ARGENTEA* Reinhardt.

Plate 35, figs. 3-3a; Plate 97, fig. 9.

*Piabina argentea* REINHARDT, Overs. Dansk. vid. selsk. forh., 1866, p. 50, tab. 1, fig. 1, 2; LÜTKEN, Vidensk. selsk., 1875, **12**, p. 226, fig. 16 (Tributaries of Rio das Velhas); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

*Creagrutus argenteus* EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 56.

*Piabina piquira* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434.

HABITAT.—Rio San Francisco, Rio Itapicuru, Upper Paraná.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3206 C. <sup>1</sup>	13	32-58	Rio Ziriga	Haseman
3207 C.	6	30-40 <sup>2</sup>	Rio Paiaia	Haseman
3208 C.	5	44-50	Rio de Jacobina at Jacobina	Haseman
3209 C. <sup>3</sup>	40	25-48	Queimadas, Rio Itapicuru	Haseman
3210 C.	6	47-65	Rio das Velhas	Haseman
3211 C.	31	30-67	Sete Lagoas	Haseman
3212 C.	4	78-90	Salta Avahandava	Haseman
3213 C.	17	32-99	Joao del Rei	Haseman
3214 C.	6	30'-45	12 m. N. of Araquay	Haseman
3215 C.	1	98	Piracicaba	Haseman
5475 C.	2		Rio Paranahyba Bridge, Paraná Basin	Haseman
5479 C.	2	25, 33	Jaguara	Haseman
2966	7	30-50	Fazenda de Amaratu, Rio Itapicu	Haseman
11630 L.	2	51, 56	Piracicaba	Von Ihering

Head 4.5; depth 4; D. 10; A. 20 or 21; scales 5-37 to 39-3; eye 2.5 to 2.75; interorbital 3.

The width about half the depth, which is about the same from between the middle of the pectorals to the middle of the dorsal; ventral surface broadly rounded, no definite median series of scales before the ventrals; predorsal area narrowly rounded, with a median series of scales.

Occipital process short, about  $\frac{1}{4}$  of the distance from its base to the dorsal, bordered by two scales on each side; interorbital distinctly convex; fontanels in the young of the same width, but the frontal fontanel much the shorter, becoming with age also narrower than the posterior; snout short, blunt, the lower jaw included; maxillary short, not more than  $\frac{3}{5}$  of the length of the eye in the young, becoming longer with age; maxillary with snout scarcely more than eye in length;

<sup>1</sup> Lateral line 39, anal 21.

<sup>2</sup> To base of caudal.

<sup>3</sup> Anal 17-22.

mandible shorter than eye; second suborbital covering the entire cheek; five (rarely six) tricuspid teeth in the original front series of teeth, the second and fourth (rarely fifth also) withdrawn from the rest, forming an intermediate series; inner series composed of four five-pointed teeth; four large tricuspid teeth in the dentary and a number of smaller, similar ones on the sides; three teeth in the maxillary.

Gill-rakers  $6 + 10$ , minute.

Scales regularly imbricate, no interpolated or omitted scales; each scale with a few divergent striae. Lateral line descending to above ventrals; caudal naked; anal with a single series of scales along the base of its anterior rays.

Origin of dorsal but a trifle nearer the snout than the caudal, above the first third of the ventrals, its highest ray 4.75 in the length; anal slightly emarginate, its origin below, on, or behind the vertical from last caudal ray; ventrals not quite to anal; pectorals just to ventrals or shorter.

Scales of the back margined with dark; sides of head and a lateral band silvery; a straight vertical humeral spot crossing the fourth and fifth scales of the lateral line. Fins mostly hyaline, dotted.

Vertebrae  $14 + 21$ ; posterior air-bladder nearly twice as long as the anterior.

## 2. *PIABINA BENI* PEARSON.

Plate 59, fig. 5.

*Piabina beni* PEARSON, Indiana univ. studies, 1925, 64, p. 15, pl. 10, fig. 5 (Popoi River).

Eleven cotypes, 17317 L., 30–40 mm. Popoi River, Upper Beni. N. E. Pearson.

Very closely related to *P. argentea* from which it differs by having the premaxillary bones more angular, thus leaving a greater space between the first and third rows of teeth.

Head about 4; depth 3; D. 10; A. 20 to 23; lateral line 5–37 to 39–4; eye about  $2\frac{1}{2}$ ; second suborbital leaving a rather wide naked area behind and below; parietal fontanel  $1\frac{1}{2}$  times as long as the frontal; interorbital slightly less than the diameter of the eye; maxillary with 2 teeth, its length equal to  $\frac{7}{16}$  the diameter of the eye; 5 teeth in the front series of the premaxillary, the third slightly withdrawn, the fourth entirely so; posterior row of 4 teeth, a single tooth between the anterior and posterior rows that has apparently withdrawn from the anterior row; mandible with 2 large teeth in front, followed by 4 teeth on the sides which regularly decrease in size; 7 gill-rakers on the lower gill-arch, their length equal to about  $\frac{1}{3}$  that of the gill filament; dorsal profile more strongly arched than the ventral;

predorsal area rounded, with a median series of 14 scales; origin of the dorsal nearer to the tip of the snout than to the base of the caudal, the second ray the longest, extending beyond the last ray when depressed; preventral area rounded, with a median series of 12 scales; origin of the ventrals slightly in advance of the origin of the dorsal; origin of the anal slightly posterior to the last dorsal ray; pectorals just reaching the base of the ventrals; ventrals reaching anal.

A vertical humeral spot, mostly above the lateral line; a silvery band; an indistinct caudal spot.

### 26a. PIABARCHUS Myers.

Piaba and ἀρχός, anus, in reference to the long anal fin.

*Piabarchus* MYERS, Ann. mag. nat. hist., 1928, ser. 10, 2, p. 90.

TYPE.—*Piabina analis* Eigenmann.

This genus has a long anal fin, its origin opposite to or slightly in front of the dorsal fin origin. In *Piabina* the shorter anal originates considerably behind the dorsal origin. In other respects like *Piabina*.

*Piabarchus* is certainly more entitled to recognition as distinct from *Piabina* than *Piabina* is from *Creagrutus*. Probably as nearly related to *Bryconamericus* as to *Piabina*.

HABITAT.—Upper Rio Paraguay.

PIABARCHUS ANALIS (Eigenmann).

Plate 89, fig. 2.<sup>1</sup>

*Piabina analis* EIGENMANN, Indiana univ. studies, 1914, 19, p. 8.

*Piabarchus analis* MYERS, Ann. mag. nat. hist., 1928, ser. 10, 2, p. 90.

HABITAT.—Upper Paraguay.

One specimen, 5478 C. Type. About 37 mm. São Luiz de Cáceves. Haseman. Resembling *Bryconamericus alburnus* but with a longer maxillary.

Head 4.3; depth 3.8; D. 10; A. 27; scales 5–40–3.5; eye 2.7; interorbital 2.5.

Compressed; width less than half the depth; preventral area rounded, with a median series of twelve scales; predorsal area rounded with a median series of fifteen scales.

Occipital process about .1 of the distance from its base to the dorsal, bordered by two scales on the sides; interorbital slightly convex; frontal fontanel a little shorter than the parietal; snout blunt, mouth small, the lower jaw included, maxillary two thirds as long as eye; second suborbital covering the entire cheek; five

<sup>1</sup> *Piabina analis* in the explanation of the plate, Part IV.

teeth on one side, six on the other in the original front series, the second and third withdrawn, four teeth in the inner series; four teeth on one maxillary, five on the other; three or four large teeth in front on each mandible, several much smaller, similar and graduate teeth on the sides. Scales as in *Piabina argentea*.

Origin of dorsal a little nearer end of lateral line than the snout; origin of anal on the vertical from the *first* dorsal ray; ventrals reaching anal, pectorals to second scale behind origin of ventrals.

Silvery, a very faint vertical humeral spot crossing the third and fourth scale of the lateral line.

## 27. BRYCOCHANDUS Eigenmann.

*βρυχω*, to bite; *χαρδον*, with a gaping mouth.

*Brycochandus durbini* EIGENMANN, Bull. mus. comp. zool., 1908, **52**, p. 106.

TYPE.—*Brycochandus durbini* Eigenmann.

This genus is *Creatochanes* in all respects but the lateral line, which is incomplete.

HABITAT.—Rio Tapajos.

### 1. BRYCOCHANDUS DURBINI Eigenmann.

*Brycochandus durbini* EIGENMANN, Bull. mus. comp. zool., 1908, **52**, p. 106.

Two specimens 20862, part cotypes. 38, 39 mm. Rio Tapajos. Dexter, James, and Thayer.

Thirty of the forty scales of the lateral line with pores. No black spots or bars on the fins and no humeral spot.

Head 4.2; depth 3.66–3.75; D. 11; A. 27; scales 6–39 to 40–4; pores on first 30 scales of the lateral line; eye 2.4 in the head; interorbital 2.5.

Compressed, slender. Head short, its depth at base of occipital process .75 of the greatest depth. Preventral region rounded, without a complete series of median scales. Postventral region narrow.

Occipital process a little more than one-fifth of the space from its base to origin of dorsal, bordered by 2 scales. Interorbital almost flat. Frontal fontanel narrow, triangular, equal to the length of the parietals without occipital groove; cheek narrow; second suborbital leaving a narrow, naked margin. Snout shorter than eye; mouth large, maxillary equal to the length of the eye, in shape like that of *Creatochanes*; mandible very slightly longer than eye, projecting, when mouth is open. Premaxillary with an inner row of five 4- and 5-pointed teeth, and an outer row of two to four which are conical or 3-pointed. Maxillary with two wide,

3-pointed teeth, and about two minute, conical ones; dentary with a graduated series of five 4- and 5-pointed teeth, terminating on sides in short series of minute conical and tricuspid teeth.

Gill-rakers about  $8 + 11$ . Scales cycloid, striae inconspicuous, few and variable in number, usually 2 or 3 on a scale; scales regularly imbricate, one interpolated scale between the first and second row below lateral line, the first 4 scales of the row immediately below the lateral line somewhat enlarged. Caudal naked. Anal sheath short, consisting of 3 or 4 scales covering the bases of the first 7 rays. Axillary scale present. Lateral line sharply decurved along first 6 or 7 scales, the series next below it about parallel anteriorly; and entirely parallel on tail.

Origin of dorsal a very little nearer snout than to caudal, the penultimate dorsal ray one half the highest, which is about 4.66 in the length. Caudal equal to the head. Origin of anal on the vertical from last dorsal ray. Anal low and distinctly emarginate. Ventrals on a vertical from first dorsal ray, just reaching the anal. Pectorals not reaching ventrals by  $\frac{2}{3}$  diameter of eye.

Dorsal rays a little dusky; anal, ventrals, adipose; pectorals hyaline. A round, hyaline spot, probably red or yellow in life, equal to length of middle caudal rays covering basal portion of upper lobe, the caudal otherwise dark. A narrow, blackish lateral stripe, subtended by a broad, silver stripe. Sides of the head and all except the two upper rows of scales on the sides iridescent. A few chromatophores scattered over the dorsal surface and a narrow area just above the anal.

## 28. CREATOCHANES Günther.

*κρεας, κρεατος*, flesh; *χαίρω* to gape, flesh eater?

*Cretochanes* GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 329.

TYPE.—*Salmo melanurus* Bloch.

Elongate, spindle-shaped fishes with brilliantly refulgent scales, but slightly compressed, reaching a length of 157 mm. Similar to the *Agoniatinae* but with rounded preventral area.

The species differ but little from each other and have the following characters in common:

Dorsal and ventral profiles gently and nearly equally arched; head moderate, very slightly arched in cross-section, profile gently arched, nowhere depressed; frontal fontanel short, triangular or linear; parietal fontanel broader and longer, rounded behind, continued as a groove to the tip of the short occipital process;



bridge between the fontanels but little below the surface. Cheeks with a very narrow naked margin below the second suborbital in the adult, otherwise covered by the suborbitals. Premaxillary with a distinct antero-posterior extent meeting the anterior portion of the maxillary at a nearly right angle; maxillary long, slipping under the first suborbital as well as under the preorbital, its anterior margin greatly arched above, straight or nearly so below; mouth large, the lower jaw freely movable; tongue but little free, fleshy.

Snout and maxillary much more than half the head in length.

Lower jaw included, with 5 or 6 large equal teeth in front, each with a long median and several minute lateral cusps, the lateral tooth somewhat recurved and followed by a series of minute teeth. Premaxillary with 5 or 6 multicuspid incisor teeth in the inner row; teeth of the outer row narrower; maxillary with two multicuspid teeth.

Gill-membranes free from the isthmus; gill-rakers about 5 + 10, slender.

Scales with 1-4, rarely more, striae; lateral line complete, decurved; a very narrow sheath composed of one series of minute scales along the bases of the first ten anal rays. Caudal lobes entirely naked; preentral region broadly rounded; predorsal and preentral areas each with a median series of scales; postventral area compressed; dorsal and ventrals equidistant from tip of snout; origin of anal entirely behind dorsal; adipose fin slightly in advance of end of anal; pectorals not or scarcely to ventrals; ventrals not to anal, with a small axillary scale.

Alimentary canal about equal to the length (without the caudal), with 11 large coeca; air-bladder large, the posterior portion more than twice as long as the anterior, not quite reaching anal.

HABITAT.—Amazons and Guiana.

#### *Key to the Species.*

- a. Maxillary extending to end of the second suborbital; its tip and posterior margin of pupil equidistant from tip of snout; suture between first and second suborbital usually extending down and back; second suborbital short, its anterior margin continued as one convex curve to the angle; normally 7, rarely 8, rows of scales between the lateral line and the dorsal; striae of scales when present nearly parallel.
- b. Caudal lobes dark, the upper darkest, with watermarks; basal spot of upper caudal lobe, dorsal and anal rays yellow; head 4.4; pectorals not reaching ventrals; second tooth of the premaxillary in line with the rest or moved forward; lateral stripe in formalin specimens diminishing in front of dorsal, not continued to the head; very highly iridescent. Head 3.8-4; depth 3.75; D. 11; A. 26-29; scales 7-44 to 47-2.5 or 3. . . . . 1. *affinis* (Günther).
- bb. Caudal lobes plain or sometimes black, a broad black stripe on about 8 rays of the caudal counting from the 2d below the middle upward; margined with red above and below; head 4.3; pectorals just reaching ventrals or very little shorter; second tooth in line with the rest or slightly withdrawn; suture between first and second suborbital very oblique. Head 4-4.25; depth 3.4-3.5; D. 11; A. 27-29; scales 7-44 to 46 (usually 45)-3; eye 2.4-3; interorbital a little greater or a little less than eye; maxillary with 1 or 2 teeth. . . . . 2. *melanurus* (Bloch).

- bbb.* A black blotch on base of caudal, continued on lower rays of upper caudal lobe; deeper, depth 3; A. 30-31.....3. *cyrtogaster* Norman.
- aa.* Maxillary not extending to end of second suborbital, its tip and middle of eye equidistant from tip of snout; suture between first and second suborbital vertical; lower jaw shorter; anterior margin of second suborbital not forming a simple convex curve to the angle above the angle of the preopercle.
- c.* Normally 6, very rarely 7, scales between the lateral line and the dorsal; upper caudal spot, dorsal and anal rays red; middle caudal rays and upper lobe beyond the red spot black with watermarks; second tooth of the front row of the premaxillary withdrawn; pectorals shorter than in *C. affinis* not reaching the ventrals; lateral stripe in formalin specimens continued to the head; less highly iridescent in life than *C. affinis*. Head 4.66-4.75; depth 3.4-3.8; D. 11; A. usually 31 (28-31); scales 6-45 or 46-3. Articulation of lower jaw slightly in advance of the suture between the first and second suborbital; maxillary teeth 0-2.....4. *caulomaculatus* (Günther).
- cc.* Scales 8-54-3; A. 33. Head 4.5; depth 4.33; middle rays and distal part of upper caudal lobe dark; teeth of the outer row of the premaxillary in a line; pectorals not reaching ventrals by 5 scales; a wide naked strip on cheeks.....5. *gracilis* Eigenmann.

## 7. CREATOCHANES AFFINIS (Günther).

Corwi or Kowi of the Wacusi Indians.

Plate 2, fig. 3; Plate 23, fig. 3.

*Tetragonopterus affinis* GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 327 (British Guiana); ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 278; VAILLANT, Bull. mus. hist. nat., 1899, 5, p. 154 (Carsevenne & Carnot, French Guiana).

*Cretochanes affinis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 435; Mem. Carnegie mus., 1912, 5, p. 345, pl. 2, fig. 3; Mem. Carnegie mus., 1922, 9, p. 237.

*Bryconops (Cretochanes) melanurus* MÜLLER & TROSCHEL (non Bloch), Schomburg, Reisen 1848, 3, p. 365 (Rupununi); STEINDACHNER, Characinen, 1875, p. 14, fig. 7 (Obidos, Rio Tapajos).

*Cretochanes melanurus* (part) STEINDACHNER, Flusssf. Südamer., 1915, 5, p. 35.

HABITAT.—Guiana, Amazons, Rio San Francisco, Paraguay.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1400 C. 11874 I.	9	70-105	Amataima, Upper Potaro	Grant
1401 C. 11875 I.	29	38-109	Holmia	Eigenmann
1402 C. 11876 I.	18	34-83	Two hours below Holmia	Eigenmann
1403 C. 11877 I.	8	29-96	Savannah Landing	Eigenmann
1404 C. 11878 I.	27	53-124	Tukeit	Eigenmann
1405 C. 11879 I.	6	32-62	Amatuk	Eigenmann
1406 C. 11880 I.	5	46-102	Creek below Potaro Landing	Eigenmann
1407 C. 11881 I.	47	54-101	Tumatumari	Eigenmann
11882 I.	5	83-96	Christianburg	Eigenmann
1408 C.	1	30	Wismar	Eigenmann
1409 C.	1	58	Warruputa	Eigenmann
1410 C. 11883 I.	2	60, 90	Konawaruk	Eigenmann
1411 C.	1	50	Bartica	Shideler
1412 C. 11884 I.	30 <sup>1</sup>	45-88	Maripicru, branch of Ireng	Grant

<sup>1</sup> Caudal lobes and middle rays uniformly black, bases of both lobes cherry red or orange. Nineteen other specimens were received from a tributary of the Ireng, whose name was not legible.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20861	9	65-100	Rio Tapajos	Dexter, James Talisman
—	8	76-105	Teffé	Agassiz
20785	1	83	Santarém	Bourget
21076	2	110, 122	Porto do Moz	Vinhas
3324 C.	2	70, 75	Barreiras, Lagoas of Rio Grande	Haseman
3325 C.	3	36-67	Santa Rita, São Francisco Basin	Haseman
3326 C.	5	31-75	Below Cachoeira de Velha de Rio Nova	Haseman
3327 C.	15	35-85	Above Cachoeira de Velha de Rio Nova	Haseman
3328 C.	14	30-92	Jaurú	Haseman
3329 C.	3	53-56	Bastos	Haseman
3330 C.	3	70-81	Maciel, Rio Guaporé	Haseman
3331 C.	3	40-65	Brazança	Haseman
3332 C.	13	67-114	Santarém	Haseman
3333 C.	3	35-38	Rio Boa Ventura	Haseman

The *melanurus* of Bloch is easily distinguished by the black caudal band. The specimens figured by Steindachner as *C. melanurus* and the specimens mentioned from the Amazon Basin lack the caudal band and have most of the characters of *affinis* instead. They are typical *affinis* and many other specimens collected by me in British Guiana have the second and fourth teeth of the premaxillary moved forward, those from the Amazon have them in line with the rest.

Head 3.8-4.2; depth 3.75; D. 11; A. 26-29.<sup>1</sup> Scales 7-44 to 47-2.5 to 3 above ventrals; 4 above dorsal;<sup>2</sup> eye 2.5-2.75 in head; snout 3.66; interorbital slightly greater than snout; maxillary reaching to the end of the prolonged second suborbital, its length about equal to half the length of the head, longer in specimens from the lowlands than in those from the Guiana plateau; premaxillary teeth with 3-5 teeth in the outer and 5 or 6 in the inner row, if there are 5 teeth in the outer series the middle one moved toward the inner series; 5 or 6 large teeth in the mandible.<sup>3</sup> Maxillary usually with 2, rarely with 1 or 3 teeth.

<sup>1</sup> In the Tapajos specimens five have 26.5; two, 28.5 and two, 29.5. In the Teffé specimens three have 27.5; one, 28.5; two, 29.5, and one, 30.5. In nine specimens from Tumatumari four have 27, two have 28 and three have 29.

<sup>2</sup> In the Tapajos specimens all have 7 scales above the lateral line and 4 above the anal; one has 44, three have 45, four have 46 and one has 47 scales in the lateral line; seven have 2.5 scales above the ventrals and two have 3. In the Teffé specimens two have 8-47-3 scales, three have 7-46-2.5, one has 7-45-3 and one 7-44-3. The usual number of scales in Guiana specimens is 46.

<sup>3</sup> Of the nine Tapajos specimens four have  $\frac{3}{5}$  teeth in the premaxillary, three have  $\frac{4}{5}$ , one has  $\frac{4}{6}$  and one  $\frac{5}{5}$ ; five have 6 large teeth in the mandible, four have 5. Of the Teffé specimens one has  $\frac{5}{5}$ , one  $\frac{4}{5}$  and five have  $\frac{5}{5}$  premaxillary teeth; the mandibular teeth are 5 in one and 6 in six specimens.

Greatest depth below dorsal; dorsal and ventral outlines regularly arched, the ventral slightly more so than the dorsal; origin of dorsal nearer tip of snout than base of caudal, equidistant from tip of snout with ventrals; height of dorsal less than length of head; pectorals at least equal to head without opercle, ventrals slightly less than highest dorsal; last anal ray about twice the length of the longest, the anal margin concave without a distinct lobe; anus halfway between anal and base of ventrals; postventral region with a median row of scales, not sharply compressed.

Sides highly iridescent, no sharply defined lateral band; no humeral spot. Each caudal lobe with a light spot near its base; middle caudal rays and upper lobe black, the dark faintest near the tip; lower caudal lobe dusky.

In the male from Santarém the depth is equal to the length of the head, the dorsal and upper half of anterior anal rays with numerous recurved hooklets.

Vertebrae 16 + 24.

In life, the base of the upper caudal lobe, the dorsal rays and adipose are yellow, the anal is tinged with yellow; very highly iridescent; both caudal lobes and middle rays sometimes uniformly black, the bases of the lobes yellow.

## 2. CREATOCHANES MELANURUS (Bloch).

Plate 23, fig. 2; Plate 98, fig. 1.

*Salmo melanurus* BLOCH, Naturge. des Ausländische fische Berlin, 1785-95, Atlas, tab. 381, fig. 2 (Surinam).

*Tetragonopterus melanurus* MÜLLER & TROSCHEL, Horae ichthy., 1845, **1**, p. 14; CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, **22**, p. 155; MÜLLER & TROSCHEL, Schomburgk's, Reisen Brit. Guiana, 1848, **3**, p. 635 (Rupununi)?; GÜNTHER, Cat. fishes Brit. mus., 1861, **5**, p. 329 (British Guiana, Essequibo); Proc. Zool. soc. London, 1868, p. 247; EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 156; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 274.

*Creatochanes melanurus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 135; Mem. Carnegie mus., 1912, **5**, p. 346, pl. 50, fig. 4.

*Creatochanes melanurus* (part) STEINDACHNER, Flössl. Südamer., 1915, **6**, p. 35.

*Creatochanes melanurus transitoria* STEINDACHNER, Flössl. Südamer., 1915, **6**, p. 37, p. 1, figs. 5, 6.

HABITAT.—Guianas.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1393 C. 11886 L.	11	36-124	Malali, Demerara River	Shideler
1394 C. 11887 L.	81	13-138	Wismar	Eigenmann
1395 C. 11888 L.	15	70-95	Christianburg	Eigenmann
1396 C. 11889 L.	18	26-100	Christianburg Canal	Eigenmann
1397 C. 11890 L.	15	63-84	Near Freiheit	
1398 C. 11891 L.	29	33-129	Lama Stop Off	Eigenmann
1399 C. 11892 L.	10	52-68	Madoonie Creek	Eigenmann

This species is readily distinguished from the other species of the genus by its excentric caudal band. It is abundant in the Demerara River and in the Mahaica Basin of British Guiana. I did not find it in the parts of the Essequibo Basin I visited.

### 3. CREATOCHANES CYRTOGASTER Norman.

*Cretochanes cyrtogaster* NORMAN, Ann. mag. nat. hist., 1926, ser. 9, **18**, p. 91 (Oyapock River).

HABITAT.—Oyapock River, French Guiana.

Depth about 3 in length; head 4–4.2. Scales 7 or  $7\frac{1}{2}$ –42 to 44–3; D. 11; A. 30–31 (28–29 branched rays). Eye 2.33 to 2.60 in head, longer than snout.

Ventral profile distinctly convex. Maxillary extending to below middle of eye, reaching posterior margin of second suborbital. Dorsal [origin?] a little nearer base of caudal than tip of snout. Anal edge slightly emarginate. Pectorals equal to or a little shorter than length of head, reaching pelvics or not quite so far. Up to 95 mm.

Silvery; an indistinct lateral stripe on posterior half of body; generally a diffuse black blotch at base of caudal, continued on to lower rays of upper caudal lobe. [Condensed from Norman. *G. S. Myers.*]

### 4. CREATOCHANES CAUDOMACULATUS (Günther).

Plate **23**, fig. 1.

*Tetragonopterus caudomaculatus* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 330 (South America); ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 278.

*Salmo melanurus* BLOCH, Ausl. fische, 1784, **8**, p. 84 (Surinam).

*Cretochanes caudomaculatus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435; Mem. Carnegie mus., 1912, **5**, p. 346, pl. 50, fig. 5; STEINDACHNER, Flüs. Südamer., 1915, **5**, p. 52 (Rio Rupununi; Rio Tacutu, trib. of Rio Branco); EIGENMANN, Mem. Carnegie mus., 1922, **9**, p. 237 (Caño Carnicera); FOWLER, Proc. acad. nat. sci. Phil., 1926, **78**, p. 254 (Rio Inhangpy in State of Pará).

HABITAT.—The Guianas, the Lower Amazon Basin, and the Meta region of Colombia.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1383 C. 11868 I.	7	68–94	Below Wismar	Eigenmann
1382 C. 11867 I.	10	51–84	Malali	Shideler
1384 C. 11869 I.	2	109–125	Creek below Potaro Landing	Shideler
1385 C. 11866 I.	269	40–120	Tumatumari	Eigenmann
1386 C. 11870 I.	9	38–60	Konawaruk pool	Eigenmann
1387 C. 11865 I.	56	27–89	Crab Falls	Eigenmann
1388 C.	1	85	Rockstone	Eigenmann
1389 C. 11864 I.	20	22–50	Gluck Island	Eigenmann

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1390 C. 11871 I.	21	55-71	Bartica	Shideler
1391 C. 11872	2	69-70	Koreabo Rubber Plantation	Shideler
1392 C. 11873	11	43-54	Mora Passage	Shideler
3334 C.	8	28-40	Above Cachoeira de Velha de Rio Nova, near Piabina	Haseman
3335 C.	5	52-70	Below Cachoeira de Velha	Haseman
3336 C.	10	38-85	Bragança	Haseman
13775 I.	2	—	Caño Carniceria, Meta Basin, Colombia	Apolinar Maria

This species is most readily distinguished from the other species of the genus by its short maxillary, the number of scales above the lateral line and the red caudal spot. Its characters are fully described in the Key and the general description of the genus.

#### 5. CREATOCHANES GRACILIS Eigenmann.

*Cretochanes gracilis* EIGENMANN, Bull. mus. comp. zool., 1908, **52**, p. 106.

HABITAT.—Rio Tapajos.

One specimen, 20868, 75 mm. Rio Tapajos. Dexter, James, and Thayer.

Head 4.5; depth 4.33; D. 11; A. 11,  $31\frac{1}{2}$ ; scales 8-54-3.5 above V. and 5 above A., maxillary not reaching to end of second suborbital, its length 2.5 in the head.

Premaxillary teeth  $\frac{4}{5}$ ; large mandibular teeth 5; maxillary without teeth.

Greatest depth in front of the middle, the body behind the ventrals slender; ventrals nearer tip of snout than the dorsal; dorsal a little in front of middle; pectorals scarcely more than snout and eye.

Otherwise much as in *C. melanurus*.

#### 29. BRYCONOPS Kner.

Bryeon, a genus of characins;  $\omega\psi$ , aspect.

*Bryconops* KNER, Characinen, 1859, p. 43.

TYPE.—*Bryconops alburnoides* Kner.

Maxillary without teeth; premaxillary with three series, mandible with a single series of teeth; ventrals below anterior dorsal rays. Anal long. This genus is a *Cretochanes* with a third row of premaxillary teeth.

HABITAT.—Rio Branco to the Guaporé.

#### Key to the Species.

- a. Anal 32-33; scales 9-55 to 60-4; depth  $4\frac{1}{2}$ . Sides with a bright, silvery band; middle and margin of the caudal fin black. . . . . 1. *alburnoides* Kner.
- aa. Anal 38; scales 9-62-4; depth 4, head 5; sides with a silvery band. Only the upper caudal lobe with a dark margin. . . . . 2. *lucidus* Kner.

## 1. BRYCONOPS ALBURNOIDES Kner.

*Bryconops alburnoides* KNER, Characinen, 1859, p. 43 (Rio Guaporé); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 56; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

*Bryconops alburnus* KNER, Characinen, 1859, taf. 9, fig. 22; GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 339.

HABITAT.—Rio Guaporé.

I have examined the two types, measuring 134 mm. and 140 mm. respectively, a portion of the caudal being broken off presumably in both; also

One specimen, 2953 C. 87 mm. Maciel, Rio Guaporé. Haseman.

Premaxillaries with a series of contiguous teeth within and two imperfect series outside. Maxillary with its anterior half very strongly arched, the posterior portion slender; no teeth on maxillary, but the convex portion ridged and roughened; 5 or 6 large teeth on each ramus of lower jaw.

Kner's spelling of the specific name on the plate, accepted by Günther, was evidently a misprint or *lapsus*.

## 2. BRYCONOPS LUCIDUS Kner.

*Bryconops lucidus* KNER, Characinen, 1859, p. 45, taf. 9, fig. 23 (Rio Branco); GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 339; EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 56; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

HABITAT.—Rio Branco, and Solimões.

One specimen, 20751. About 152 mm. Tabatinga, Bourget.

Head 4.8; depth 4.5; D. 11; A. 38; scales 8-58-4; eye 2.75, equal to inter-orbital.

Long slender, subfusiform, preventral and postventral surfaces rounded, predorsal area bluntly keeled, without a distinct median series of scales.

Occipital process less than  $\frac{1}{8}$  of the distance of its base from the dorsal, bordered by 2 scales on the sides; profile of head nearly straight to above the nares and then decurved; interorbital slightly convex; cheeks narrow, with but a very narrow naked border; antero-posterior extent of the premaxillary about .4 of the length of the snout; maxillary much as in *Cretochanes*, greatly convex nearest the premaxillary, its margin behind the convexity, straight or slightly concave; premaxillary with another series of straight margined, wide-set three-pointed teeth, an inner series of broad, contiguous seven-pointed teeth, more convex behind than in front but the denticles in a nearly straight line; a middle series of two three-pointed teeth, similar to those of the outer series, one

placed opposite the spaces of the first and second teeth of the outer and inner series and the other opposite the space between the third and fourth of the outer series and second and third of the inner series; lower jaw with 6 teeth, graduated and ranging from seven points nearest the symphysis to three points in the last of the series, about 6 minute conical teeth continuing the series on the side.

Gill-rakers 9 + 12, very small.

Scales thin, cycloid, the exposed faces of those on anterior part of body with converging striae, those of the posterior part with subparallel striae; scales regularly imbricate, without interpolated series; caudal naked, anal sheath not attached to the rays; a large axillary scale; lateral line not evident on the first few scales.

Origin of the dorsal a little nearer the tip of snout than base of caudal, small; caudal deeply forked, anal basis long, about 3.3 in the length, equal to the space between the dorsals, its margin slightly emarginate; origin of ventrals in front of the dorsal, not quite reaching anal, pectorals not to ventrals by 4 scales.

Middle caudal rays and tips of the rest dusky, otherwise without distinct markings.

### 30. PHENACOGASTER Eigenmann.

φίναξ, δ, a cheat; γαστήρ, ἦ, the belly. Peculiar scaling of the preventral area.

*Phenacogaster* EIGENMANN, Amer. nat., 1907, **41**, p. 769.

TYPE.—*Tetragonopterus pectinatus* Cope.

Small, compressed fishes reaching a length of 85 mm. This genus differs from all others<sup>1</sup> in the peculiar squamation of the preventral area. The pre-ventral area is flat and covered by two series of elongate scales, bent at the sides to form the lateral angles and overlapping in the center. There may or may not be a small scale in the angle of the two scales; maxillary with numerous teeth along a large part of its margin; premaxillary teeth numerous, three-lobed near the symphysis, conical toward the maxillary. Dorsal pointed.<sup>2</sup>

HABITAT.—Upper Amazons, Bolivia, Guiana, Rio San Francisco.

<sup>1</sup> The remarkable *Atopomesus pachyodus*, of the Cheirodontinae, recently described from the Upper Rio Negro, has exactly the same structure of the pre-ventral scales, combined with a massive dentition recalling that of *Creagrutus*. Indeed it might be supposed that the single known specimen was a hybrid between *Phenacogaster* and *Creagrutus*, were it not for the enlarged caudal fulcra, a typical cheirodontine character. The teeth, also, are in a single row and differ widely in form and arrangement from those of *Creagrutus*. G. S. Myers.

<sup>2</sup> The species described as *Phenacogaster bondi* Fowler, Proc. acad. nat. sci. Phil., 1911, p. 419 from Corisal, Venezuela, is not a member of this genus. It is a *Moenkhausia*. (See *supra*, p. 69.)



*Key to the Species.*

- a. Lateral spot minute, inconspicuous. Anal rays 36-41; premaxillary teeth in two rows, of which the outer is with a gap between the tricuspid teeth near the inner, and the conical teeth near the outer edge; the conical teeth at the outer edge frequently bunched; few, if any, scales in the angles of the pairs of scales along the ventral surface. Base and margin of anal dotted, the middle hyaline. Maxillary teeth along more than half the free edge.
- b. A. 40-45, most frequently 42; scales 6 or 7-38 to 41-5; maxillary with 24-34 teeth; a faint caudal spot and middle caudal rays dark; premaxillary teeth  $\frac{2 \text{ to } 3 + 2 \text{ to } 4}{5 \text{ to } 7 + 2 \text{ to } 5}$ ; mandibular teeth 5 or 6 + 11 to 14.....1. *pectinatus* (Cope)
- bb. A. 36-37; scales 7-39-5; maxillary with 21 teeth; middle caudal rays punctate; premaxillary teeth  $\frac{3-4 \text{ or } 5}{7 + 3}$ ; mandibular teeth 5 + 8.....2. *beni* Eigenmann.
- bbb. A. 37-40; scales 6-38 or 39-5; maxillary with 17 teeth, middle caudal rays scarcely punctate; premaxillary teeth  $\frac{2 \text{ or } 3 + 1 \text{ or } 2}{3 \text{ or } 4 + 4 \text{ or } 5}$ , mandibular teeth 7 + 7.....3. *microstictus* Eigenmann.
- aa. Lateral spot large, conspicuous; anal rays 31-37; premaxillary teeth in two complete series.
- c. No scales in the angles between the pairs of scales of the ventral surface; maxillary with 25-30 teeth along its entire free margin. A. 31-34; scales 6-35 or 36-4, depth 2.66-2.75.  
4. *franciscoensis* Eigenmann.
- cc. A scale in the angle of each pair of the ventral surface except the two pairs between the pectoral; maxillary with 11-16 teeth along less than half of its edge. A. 33-37, scales 6-33 to 36-4 or 5; depth 2.66.....5. *megalostictus* Eigenmann.

## 1. PHENACOGASTER PECTINATUS (Cope).

Plate 68, figs. 2-5.

*Tetragonopterus pectinatus* COPE, Proc. Amer. philos. soc., 1870, p. 560 (Pebas); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 273.

*Astyanax pectinatus* FOWLER, Proc. acad. nat. sci. Phil., 1906, p. 341, fig. 30.<sup>1</sup>

*Phenacogaster pectinatus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 431.

*Tetragonopterus tabatingae* STEINDACHNER, Ichthyol. beitr., 1876, **5**, p. 43 (Tabatinga); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 273.

*Tetragonopterus bairdii* STEINDACHNER, Anz. akad. Wien, 1882, p. 179 (Tabatinga); Flüßf. Südamer., 1882, **4**, p. 35; EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 273.

*Phenacogaster bairdi* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 431.

HABITAT.—Marañon to Cudajas.

I have examined one of Cope's cotypes. It is in a bad state of preservation; in the characters observable it differs very little from specimens from Tabatinga, which undoubtedly represent Steindachner's *P. tabatingae*.

The maxillary and snout are a little greater than the eye. A. 39; D. 11; scales 6-?-5.

Two three-pointed teeth in the outer row of the premaxillary near the middle, one single-pointed tooth near the outer edge; inner series composed of 7 teeth, of which the 3 middle ones are at least three-pointed, removed somewhat from

<sup>1</sup>This figure is labeled *Astyanax longior*. The figures of the two species were apparently exchanged inadvertently.

the rest, of which at least the last is conical; numerous conical teeth in the maxillary.

Five larger teeth in the dentary and a number of smaller ones.

There is no doubt that the specimens in hand represent Steindachner's *Tetragonopterus bairdii*. Steindachner makes out the following differences between *bairdii* and *tabatingae*.

<i>Tabatingae</i> 45 mm. long	<i>Bairdii</i> 47 mm. long
Head 4-	3.6-3.66
depth 2.75	3+
A. 40-42	43
scales 6-37 to 38-4	6-37 to 38-4
eye 2.66	2.6-3
snout 4.33	4.
interorb. 3.66	3-3+
origin of dorsal in advance of middle	about middle, equals length of head
pectoral equals ventral	pectoral longer than ventral

I am inclined to consider them identical. Both are probably synonymous with *P. pectinatus*. Steindachner mentions only a few teeth in the maxillary, but they may readily have been overlooked, for it is only in badly preserved or especially prepared specimens that they can be seen along the entire length of the maxillary.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20964	55	36-50	Cudajas	Thayer & Bourget
20831	3	37-45	Obidos	James
20809	27	29-50	Iça	James

Head 3.75-4; depth 2.6-3; D. 11; A. 40-44<sup>1</sup>; scales 6 or 7-38 to 41-5; eye 2.75-3; interorbital not quite equal to eye.

Compressed, subrhomboidal, ventral profile regularly arched; dorsal profile somewhat depressed over eye, humped in front of the dorsal; preventral area flat, with two series of larger scales overlapping along the middle; midline of postventral area naked; predorsal area obscurely keeled, with a practically complete median series of scales.

Occipital process about 4.5 times in the distance from its base to the dorsal, bordered by 4 scales on the sides; head small, the lower jaw included; nares close together; fontanels large, the frontal fontanel narrow, pointed in front, reaching

<sup>1</sup> Of twenty species three have 40, one 41, nine 42, four 43, and three 44. Among these, two specimens from Obidos with 40 and one with 41 are included.

to above the anterior margin of the pupil; parietal fontanel broader but scarcely longer, continued as a groove to the tip of the broad occipital crest; interorbital slightly convex; bridge between the fontanels flush with the surface of the skull; cheeks in large part naked, the second suborbital not nearly covering it; premaxillary with scarcely any antero-posterior extent; maxillary of nearly equal width throughout, not slipping under or over the preorbital and first suborbital; mouth moderate, little oblique, snout and maxillary not equal to the eye.

Lower jaw with about 5 narrow, tricuspid, graduated teeth, followed on the side by a series of 11–14 minute, conical, partly retrorse teeth; maxillary with 24–34 conical, graduated teeth extending along most of its anterior margin; premaxillary with a continuous inner series composed of 5 to 7 tricuspid and 2 to 5 conical teeth; *the outer series of the premaxillary is interrupted* and consists of 2 or 3 tricuspid teeth and 2 to 4 conical ones; there is a vacant space between the lateral tricuspid tooth and the conical teeth.

Gill-membranes free from the isthmus, about 8 slender rakers in the lower arch, much shorter than the filaments.

Scales with numerous concentric striae but no radial ones; lateral line very slightly decurved; a very narrow tapering sheath composed of a single series of decreasing scales along the base of the first ten anal rays; anal otherwise naked; caudal naked.

Dorsal high, its origin near the middle of the body; origin of anal in advance of middle of body, slightly falcate in front; ventrals extending beyond origin of anal, pectorals beyond origin of ventrals; ventrals with a small axillary scale.

Specimens from Cudajas and Obidos, with a small humeral spot over the 6th and 7th, or 7th and 8th, or 8th and 9th scales of the lateral line; middle caudal rays dark; a black line connecting humeral spot and caudal spot; an obscure deeply lying spot at the base of each caudal lobe; base and margin of anal sometimes dotted, the middle hyaline, the hyaline sometimes extending over the base of the anterior rays. These markings much less distinct in the specimens from Obidos and frequently entirely lacking in those from Iça.

Alimentary canal scarcely as long as the fish without the caudal. Pyloric coeca 7, six of them in a compact, longitudinal row. Posterior section of the air-bladder but little larger than the anterior, rounded behind, not extending much beyond the origin of the anal.

Vertebrae 12 + 23.

## 2. PHENACOGASTER BENI Eigenmann.

Plate 58, figs. 1, 3.

*Phenacogaster beni* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 174.

HABITAT.—Guaporé Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3229 C. Type	1	48	Villa Bella, Rio Beni	Haseman
3230 C. Paratypes	2	39, 41 <sup>1</sup>	Villa Bella, Rio Beni	Haseman
Paratype	1	46	Maciel, Rio Guaporé	

Head 4.4; depth 2.66; D. 10; A. 36 or 38; scales 8–39–5; eye 2.75; inter-orbital 3.

None to three scales in the angles of the overlapping scales of the ventral surface.

Premaxillary with 3 tricuspid and 4 or 5 conical teeth in the outer series, 7 tricuspid and 3 conical teeth in the inner series. Dentary with 5 tricuspid and 8 conical teeth.

A faint humeral spot over the seventh scale of the lateral line; a dark, deep-lying line; a small caudal spot; middle caudal rays dotted; base of anal dotted, its margin blackish.

Allied to *P. microstictus* but deeper.

In one of the specimens the humeral spot is absent and *the lateral line is developed on but 26 scales.*

## 3. PHENACOGASTER MICROSTICTUS Eigenmann.

Plate 56, fig. 1.

*Phenacogaster microstictus* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 30; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 431; Mem. Carnegie mus., 1912, 5, p. 368, pl. 33, fig. 4.

HABITAT.—Essequibo Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1063 C. Type	1	48	Tumatumari, Lower Potaro	Eigenmann
1064 C. { Paratypes	7	28	Konawaruk, Essequibo River	Eigenmann
11751 I. }				
1065 C.	1	29	Rockstone, Essequibo River	Eigenmann
1064 C. { Paratypes	4	35–46 about	Crab Falls, Essequibo River	Eigenmann
11752 I. }				

<sup>1</sup>To base of caudal.

Head 4; depth 2.8; D. 11; A. 37-40, most often 39; scales 6-38 or 39-5; eye 2.5; interorbital 3.5.

Only one or two small scales in the angles of the overlapping scales of the ventral surface; interorbital slightly convex. Maxillary with about 17 teeth along most of its length; premaxillary with 3 or 4 tricuspid and 4 or 5 conical teeth in the inner series; 2 or 3 teeth similar to the larger ones in the outer series, and possibly sometimes a few conical ones; mandible with 7 larger and about 8 minute conical teeth.

Scales with concentric striae, very few or inconspicuous radial striae.

Straw-colored; a very faint and small humeral spot over the 7th scale of the lateral line; a dark, deep-lying line; two small deep-lying black spots at the bases of the caudal lobes, no caudal spot; caudal, except the middle of the base of the lobes, dusky; base and margin of anal dotted, the middle hyaline; sides of head and body profusely dotted, the dots on the flanks and back margining the scales, the margin consisting of a single row of chromatophores on the flank, of several rows on the back; dots over the anal muscles following the muscle septa. Cotypes all very much lighter.

In one of the specimens from Crab Falls the humeral spot is conspicuous owing to the expansion of the chromatophores.

Closely allied to *P. pectinatus*, differing in the number of anal rays, the teeth, etc.

#### 4. PHENACOGASTER FRANCISCOENSIS Eigenmann.

Plate 58, fig. 2.

*Phenacogaster franciscoensis* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 173.

HABITAT.—San Francisco Basin, and the upper Rio Tocantins.<sup>1</sup>

##### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3231 C. Type	1	38	Boqueiras, mouth of Rio Preto	Haseman
3232 C.	3	37-41	Boqueiras, mouth of Rio Preto	Haseman
3233 C.   Paratypes	3	27-30 <sup>2</sup>	Santa Rita, San Francisco Basin	Haseman
3234 C.	8	30-35	Barreiras, Lagoa of Rio Grande	Haseman
3235 C.	5	39-42	Januaria	Haseman
6801 C.	1	—	Rio das Velhas	Haseman

<sup>1</sup> Specimens have recently been received from the Rio Maranhao, Upper Tocantins, Goyaz. G. S. Myers.

<sup>2</sup> To base of caudal.

Head 3.75; depth 2.66–2.75; D. 11; A. 31–34<sup>1</sup>; scales 6–35 or 36–4; eye 3 in the head, somewhat greater than interorbital.

Very closely related to *P. megalostictus* from Guiana, with which it seems to agree in nearly all characters; *P. megalostictus* attains a larger size and is a little more slender.

Maxillary with 25–30 teeth along nearly its entire free margin. Premaxillary with two complete parallel series of teeth. Each series composed of tricuspid teeth toward the inner and conical teeth toward the outer end.

The following combinations of teeth have been observed, the first number in each case being tricuspid teeth.

Outer series 2+5, 3+4, 3+5, 2+5  
Inner series 6+2, 5+2, 6+3, 5+5

Gill-rakers 6 + 8.

Origin of dorsal and anal a little nearer the caudal than the tip of the snout.

A large, conspicuous, black lateral spot, bordered by silvery behind, its center over the fifth or sixth scale of the lateral line. A conspicuous caudal spot, occupying the entire width of the end of the peduncle, continued on the middle rays but usually not to their tip, these markings faint in the specimens from Januaria, the fins dark. Base of caudal lobes milky-white (red in life?).

## 5. PHENACOGASTER MEGALOSTICTUS Eigenmann.

Plate 56, fig. 2; Plate 95, fig. 2.

*Phenacogaster megalostictus* EIGENMANN, Ann. Carnegie mus., 1907, **4**, p. 28; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 431; Mem. Carnegie mus., 1912, **5**, p. 366, pl. 53, fig. 3.

HABITAT.—Essequibo Basin, Guiana and the Rio Negro.<sup>2</sup>

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1056 C, Type	1	65	Tumatumari, Lower Potaro	Eigenmann
1057 C. } 11746 I. }	59	42–47	Tumatumari, Lower Potaro	Eigenmann
1058 C.				
1059 C. } 11747 I. }	5	47–64	Tukeit, Lower Potaro	Eigenmann
1060 C. } 11748 I. }				
	4	68–85	Amatuk, Lower Potaro	Eigenmann

<sup>1</sup> Of those examined, five have 31, three 32, four 33, and one has 34.

<sup>2</sup> Specimens apparently representing this species have recently been received from Camanáos Rapids, Rio Negro. *G. S. Myers.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1061 C. } 11749 I. }	16	41-64	Crab Falls, Essequibo	Eigenmann
1062 C. } 11750 I. }	18	36-64	Rockstone, Essequibo	Eigenmann

Head 3.8-4; depth about 2.66; D. 11; A. 33-37; usually 35 or 36<sup>1</sup>; scales 6-33 to 36<sup>2</sup>-4 to 5; eye 2.33-2.66; interorbital 3½-4.

Elongate rhomboidal, heavy forward, the tail much compressed, profile compressed over the eye, arched in front of the dorsal; preventral area flat, with two series of large scales overlapping along the middle, a small scale in the angle of each pair of the overlapping scales except the two pairs between the pectorals; midline of postventral area naked; predorsal area bluntly keeled, with about ten median scales.

Occipital process ¼ or ⅕ of the distance from its base to the dorsal, bordered by four scales on the sides; interorbital flat, the upper margin of large eye on a level with the middle of interorbital; frontal fontanel as long as the parietal, narrower than the parietal, reaching to above the anterior margin of the pupil; second suborbital corrugate, leaving a wide naked margin; premaxillary-maxillary border without a distinct angle, moderately oblique; maxillary of nearly equal width throughout, not slipping under or over the first suborbital; snout blunt, the lower jaw included.

Mandible with 4 to 6 narrow graduated teeth, with a large central cusp and a minute lateral cusp on each side; sides of mandible with about 10 minute conical teeth; premaxillary with 4 tricuspid and 4 conical teeth in the front series which is in a line parallel with the second row, which consists of about 5 or 7 three-lobed teeth and 1 to 3 conical ones arranged in a contiguous series; maxillary with 11-16 conical or three-lobed teeth along less than half the length of the maxillary.

Gill-rakers 4 + 9.

Scales everywhere regularly imbricate, without interpolated scales; each scale with several radiating striae; lateral line slightly decurved; anal sheath of a single series of graduated scales along the base of the first rays; caudal naked; axillary scale small.

Origin of the dorsal a little in advance of the middle, pointed, the rays very rapidly decreasing from the highest, which is equal to about a third of the length.

Origin of anal about equidistant from snout with the third dorsal ray, emar-

<sup>1</sup> Of those examined three with 33, four 34, six 35, seven 36 and two 37.

<sup>2</sup> Of those examined two with 33, three 34, eight 35, and ten 36.

ginate; ventrals extending slightly beyond origin of anal; pectorals beyond base of ventrals.

Straw-colored, a silvery lateral band; slightly iridescent. A large conspicuous subcircular spot over the 6th to 8th scale of the lateral line occupying the width of two scales (this spot frequently with a lunate encroachment in front); upper part of opercle and area below eye spotted, sometimes the rest of the cheek also spotted; a black median line more or less evident; a large caudal spot extending to near the middle (sometimes further) of the median caudal rays; scales of the back always broadly margined with black, those of the flanks less so; above the anal the markings of the margin of the scales mixed with the lines of chromatophores following the muscle-segments; tips of caudal nigrescent; anal nearly, uniformly dotted or the base and tip dotted, the rest hyaline; first anal rays milk-white.

All the markings except the humeral spot may be very faint. Dorsal, caudal and anal red in life.

Vertebrae 12 + 19.

### 31. VESICATRUS Eigenmann.

*Vesica*, f. urinary bladder; *atrus*, black. In allusion to the black blotch over the urinary bladder.

*Vesicatrurus* EIGENMANN, Ann. Carnegie mus., 1911, **8**, p. 174.

TYPE.—*Vesicatrurus tegatus* Eigenmann.

This genus is *Phenacogaster* with an incomplete lateral line.

HABITAT.—Upper Paraguay Basin.

#### 1. VESICATRUS TEGATUS Eigenmann.

Plate 52, fig. 4.

*Vesicatrurus tegatus* EIGENMANN, Ann. Carnegie mus., 1911, **8**, p. 174.

HABITAT.—Upper Paraguay Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3208 C. Type	1	33 <sup>1</sup>	Jaurú, Upper Paraguay Basin	Haseman
3202 C. Paratypes	7	31-33 <sup>1</sup>	Jaurú, Upper Paraguay Basin	Haseman
3203 C.	2	30 <sup>1</sup>	São Luis de Cáceres, Upper Paraguay Basin	Haseman

<sup>1</sup> To base of caudal.



Head 3.75-4; depth 2.75; D. 10; A. 34-38 usually 36. Scales 6 or 7-37 (rarely 35)-4; eye 3 in the head, a little greater than the interorbital.

Compressed, subrhomboidal. Ventral profile regularly arched; dorsal profile somewhat depressed over the eye, rising to the dorsal fin. Preventral area flat, with two series of larger scales overlapping along the middle; sometimes a scale in the angle between the two scales of a pair; predorsal area obscurely keeled, apparently with a complete median series of scales.

Occipital process about 4.5 times in the distance from its base to the dorsal, bordered by about three scales on each side.

About 19 teeth along three fourths of the free margin of the maxillary; premaxillary with two complete and parallel series of teeth; 2 to 4 tricuspid and 4 conical teeth in the outer series; 6 or 7 tricuspid and 1 or 2 conical teeth in the inner; about 15 teeth in the dentary, the anterior tricuspid, the last conical, those between graduated.

Origin of anal and dorsal about equidistant from tip of snout and base of caudal. Pectorals extending past origin of ventrals, ventrals past origin of anal; anal slightly emarginate. Lateral line developed on 8 scales. Concentric ridges numerous, radial striae few and obscure.

A conspicuous black spot, somewhat smaller than the eye just in front of or partly on the line joining origins of dorsal and anal, just over the urinary bladder; a conspicuous caudal spot occupying the entire end of the caudal peduncle and continued on the middle caudal rays; sides, except just about the lateral spot and over abdominal cavity, peppered.

This species, resembling *Phenacogaster megalostictus*, is readily distinguished by the incomplete lateral line and the posterior position of the lateral spot.

### 32. GENYCHARAX Eigenmann.

γέρες, ἦ, cheek; Charax, a genus of characins, from χάραξ, ὅ, a palisade (of teeth). A peculiarly checked charax.

*Genycharax* EIGENMANN, Indiana univ. studies, 1913, **18**, p. 22.

TYPE.—*Genycharax tarpon* Eigenmann.

Genus allied to the *Tetragonopterinae* on the one hand, and to *Erodon* on the other. Its mouth a duplicate of that of the *Tarpon*. Its unicuspid teeth place it with the *Characinae*; the arrangement of the teeth and general characters place it with the *Tetragonopterinae*.

Origin of dorsal midway, or but slightly behind midway, between snout and caudal. Anal comparatively short, its origin behind the vertical from last dorsal

ray. Pectorals not overlapping ventrals. Mouth large, oblique, the tip of the lower jaw entering the profile, the dentary teeth engaging the outer series of the premaxillary teeth. Maxillary very large. A few teeth in a single series on the upper part of the maxillary. Premaxillary with two series of teeth, those of the outer series numerous, small, forming a compact series directed forward and slightly upward. Teeth of the inner series much larger and fewer (not more than 6), directed downward. Dentary with about 6 large, recurved teeth in the transverse series, the series continued on the sides by over 20 graduate, incurved teeth. Teeth all unicuspid, triangular or with a minute notch on each side, especially in the premaxillary series of the young. Lateral line complete. Adipose fin well developed.

HABITAT.—Upper Cauca Basin.

# 1. GENYCHARAX TARPON Eigenmann.

Plate 51, fig. 3; Plate 98, fig. 2.

*Genycharax tarpon* EIGENMANN, Indiana univ. studies, 1913, 18, p. 22. Mem. Carnegie mus., 1922, 9, p. 145.

HABITAT.—Upper Cauca Basin.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4808 C. Type	1	174	Cartago	Eigenmann
4809 C. } 12672 I. { Paratypes	11	—	Cartago	Eigenmann
4810 C. } 12673 I. {	3	—	Paila	Eigenmann
4811 C. } 12674 I. {	11	—	Cali, Cauca River	Eigenmann

Head 3.4; depth 2.75–3; D. 11; A. 23–25; scales 10 to 12–56 to 68–10 to 12. Eye equal to snout, 4 in the head; interorbital 3–3.5 in the head.

Elongate, subrhomboidal; profile depressed over the eyes. Ventral and predorsal regions rounded, without distinct median series of scales. Interorbital broad; frontal fontanel triangular, 1.5 in the parietal, as wide as latter at its posterior end. Maxillary extending beyond the second suborbital, to below the posterior edge of the head. Third suborbital in contact with the preopercle behind, leaving a wide naked area below. Four maxillary teeth; about 16 teeth in

front row of premaxillary, 6 in second row (one tooth between the outer ends of the two rows); about 28 teeth in the dentary.

Gill-rakers 6 + 11, the longest nearly half length of eye.

Dorsal small, its highest rays not reaching half way to the caudal. Lower caudal lobe a little the longer, equal to head less opercle; anal rather low, but slightly emarginate, the tip of the highest ray reaching but little beyond base of the lowest, somewhat beyond the middle of the fin. Ventrals not reaching the anal, frequently not beyond the anus. Pectorals sometimes reaching the ventrals, usually much shorter.

Fins all naked; only a sheath of one row of scales along base of anal anteriorly. Axillary scale well developed, but short. Scales all cycloid, not conspicuously regular in arrangement. Lateral line decurved to above last fourth of the pectorals, thence straight.

A plumbeous lateral band, slightly expanded upon the caudal peduncle, but only faintly, or not, continued on the caudal fin; a vertically elongate humeral spot; anal and caudal lobes yellow or orange.

Stomach very large (distended with locusts), coecal, about seven, large, pyloric, coeca. Entire canal not quite equal to the entire length. Air-bladders large, the anterior subcubical, one half longer than the eye, about four tenths the length of the conical, posterior bladder.

A game fish of the upper Cauca River.

### 33. *Scissor* Günther.

? Comparative of *scissus*, split. In allusion to the large mouth.

*Scissor* GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 331.

TYPE.—*Scissor macrocephalus* Günther.

This genus differs from all the other Tetragonopterids by its short, lanceolate gill-rakers; anal long; lateral line complete; dorsal midway between ventral and anal. Maxillary-premaxillary border without a distinct angle, maxillary slipping under preorbital but not concealed by it. Premaxillary with an outer series of small teeth, four in number on each side, and an inner series of five teeth, graduated, each with a slender median point and a number of small lateral points. Maxillary with about ten teeth on its anterior half. Mandible with seven graduated teeth on each side, behind which are about seven teeth of equal size. The larger teeth well separated from each other, the space between the cutting edges of two teeth about equal to one of the teeth inverted, the margins of the teeth

slightly serrate; snout and maxillary less than half the length of head. Gill-rakers of the first and second arch nearly alike, those of the lower arch of the first gill near the angle shorter, rounded.

HABITAT.—? Surinam.

# 1. SCISSOR MACROCEPHALUS Günther.

Plate 64, fig. 7.

*Scissor macrocephalus* GÜNTHER, Cat. fishes Brit. mus., 1861, **5**, p. 331 (Surinam?); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 51, EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 431.

HABITAT.—Surinam?

This species is known only from Günther's type in the British Museum from which I have drawn the generic description.

"D. 11; A. 29; scales 7-38-6; depth  $3\frac{1}{4}$ ; head  $3\frac{1}{3}$ ; nape abruptly elevated behind occiput; maxillary extending beyond anterior margin of eye; the two middle teeth of the mandible widely apart to receive two teeth of the upper jaw between them; caudal forked to the base. Uniform, a blackish band on root of the caudal fin and along its middle rays." *Günther*.

The locality is not certainly known.

# 34. HENOCHILUS Garman.

*τερ*, one, and *χελος*, lip; single lip.

*Henochilus* GARMAN, Bull. Essex inst., 1890, **22**, p. 49, pl. 1.

TYPE.—*Henochilus wheatlandii* Garman.

No upper lip; teeth very regular, spatulate, notched at the base, imbricate, in a single series except for a pair of small conical teeth in the lower jaw in front and 2 more notched teeth behind the front series in the upper jaw; 16 or 17 teeth in the upper jaw, of which 8 are on the maxillary, the maxillary suddenly dwindling behind the tooth-bearing part, slipping under but not concealed by the preorbital. The upper jaw recalls those African genera in which the premaxillary and maxillary are ankylosed and together movable. Suborbitals not covering the cheek. Gill-membranes free from the isthmus; gill-rakers well developed but small, 17 on lower arch; scales large, cycloid; lateral line complete; alimentary canal wide. A vegetable feeder.

This genus is an aberrant member of the *Tetragonopterinae*. Its dentition is unique among all American characins save the next genus.

HABITAT.—Rio Mucury.

1. *HENOCHILUS WHEATLANDII* Garman.

Plate 3, fig. 4; Plate 66, figs. 1-4; Plate 94, fig. 1.

*Henochilus wheatlandii* GARMAN, Bull. Essex inst., 1890, **22**, p. 49 (Santa Clara, Rio Mucury); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 51; EIGENMANN, Rept. Princeton univ. expel. Patagonia, 1910, **3**, p. 430.

HABITAT.—Rio Mucury.

One specimen, M.C.Z. 21109, type, 413 mm., Santa Clara on the Mucury, Hart and Copeland and one specimen M.C.Z. 21105, 225 mm.

Head 4.5; depth 2.75-3.2; D. 11 or 12; A. 26 or 27; scales 7 or 8-44 to 47-4 or 5; eye 3.5 to 5 in head, 1.25-2 in snout, 2.5 in the interorbital; gill-rakers short, slender; second suborbital about equal to the eye in size; pectoral fins about as long as the head, reaching a little more than halfway to the ventrals; origin of dorsal in the middle of the body, behind the ventrals, which reach about halfway to anal; origin of anal behind the last ray of the dorsal; margins of scales membranaceous. A plant-eater.

35. *PSALIDODON* Eigenmann.

ψαλιδων, τό, a clipper; ὀδών, ὁ, tooth. In allusion to the nipper-like dentition.

*Psalidodon* EIGENMANN, Ann. Carnegie mus., 1911, **8**, p. 165.

TYPE.—*Psalidodon gymnodontus* Eigenmann.

No lips, the teeth exposed; dentary with 6 incisors, followed by 4 to 6 smaller teeth in an incurving series. Premaxillary with a single series of five or six incisors, maxillary with three similar but smaller teeth. The incisors of both upper and lower jaws with a broad, sometimes nicked central lobe and a much smaller point on each side; the cutting edges forming a continuous curve. Caudal naked; lateral line complete; cheeks not entirely covered by the suborbital.

This genus bears a close resemblance to *Henochilus*. I am not sure whether it is derived from *Henochilus* and has lost its inner premaxillary teeth or whether *Henochilus* is in process of developing them.

HABITAT.—Rio Iguassú, southeastern Brazil.

1. *PSALIDODON GYMNODONTUS* Eigenmann.

Plate 57, figs. 1, 2; Plate 94, fig. 2.

*Psalidodon gymnodontus* EIGENMANN, Ann. Carnegie mus., 1911, **8**, p. 166.

HABITAT.—Rio Iguassú.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3204 C. Type	1	189	Porto União, Rio Iguassú	Haseman
3205 C. Paratypes	2	145, 165	Porto União, Rio Iguassú	Haseman

Head 4.25; depth 3.5 in the type, 2.8 in the specimen 145 mm. long; D. 11; A. 21; scales 6-36 to 39-4 or 5; eye equal to the snout, 3.5-3.75 in the length of the head; interorbital 3 or a little less; maxillary-premaxillary border 2.5 in the head.

General shape varying greatly, elongate to deep, compressed. Ventral surface rounded, without median series of scales; predorsal area narrowly rounded, without median series of scales; about 12 series of scales in front of the dorsal.

Occipital process a little less than 6 in the distance from the base to the dorsal, bordered by three scales on the side; head convex and smooth; fontanel narrow, the anterior about half as long as the posterior with the occipital groove; second suborbital leaving a naked area a little more than a fourth of its own width around its entire margin.

Gill-rakers 5 + 13, slender and pointed, about  $\frac{2}{3}$  orbital diameter in length.

Origin of dorsal about an orbital diameter nearer the snout than the base of the middle caudal rays, its margin truncate, its first ray 5 or 6 in the length; caudal forked, its lobes 4-4.5 in the length; anal distinctly emarginate, its anterior rays 6-7.5 in the length; first anal ray nearly an orbital diameter behind the vertical from the last dorsal ray; ventral reaching to anus, 7 in the length; pectorals not nearly reaching ventrals. Lateral line complete, somewhat decurved to above the end of the pectoral; scales regularly imbricate except over the anal, each with numerous divergent radial striae; caudal naked; anal with an inconspicuous sheath at the base of the anterior part. Silvery or plumbeous; an obscure vertical humeral bar; a silvery lateral band; dorsal and margin of caudal and anal, in the two larger specimens, dusky.

The smallest of the three specimens differs notably. Its teeth have the central lobe longer, it is much deeper, which changes the ratios in general; it is plumbeous, and more of the anal is dusky than in the other specimens.

#### *The African Tetragonopterinae.*

It is an open question whether the African species of Tetragonopterinae, fifty-three in number,<sup>1</sup> and the South American species, have been derived from a common ancestor less remote than the parental stem of the family or whether the similarity of the two groups of species is due to convergent or parallel development. In the African genera a pair of conical teeth are usually present behind the regular series of teeth in the dentary. The supposed African *Pellegrinina* is probably the South American *Chalceus*.

[The African Tetragonopterinae will be dealt with elsewhere by Mr. G. S. Myers.]

<sup>1</sup> In 1916.

## SUBFAMILY RHOADSIINAE.

Small, compressed fishes of western Ecuador, Colombia, and Costa Rica. They have the characters of the *Cheirodon* group of the *Cheirodontinae* when young and the characters of the *Tetragonopterinae* when fully grown. The teeth of the sides of the lower jaw are large and thorn-like, the anterior ones radiating on the raised edge of the jaw, the posterior ones are recurved. The dorsal becomes long, falcate in the fully grown, reaching the caudal. A single series of teeth in the premaxillary in the young, two series in the fully grown.

*Key to the Genera.*

- a.* Lateral line complete..... 36. *Parastremma* Eigenmann.  
*aa.* Lateral line incomplete..... 37. *Rhoadsia* Fowler.

## 36. PARASTREMMA Eigenmann.

παραστρέμμα, τδ, something twisted. The twisted lower jaw.

*Parastremma* EIGENMANN, Indiana univ. studies, 1913, 18, p. 20.

TYPE.—*Parastremma sadina* Eigenmann.

General features of *Astyanax*.

Premaxillary with an outer series of 2 conical teeth, 5 teeth in the inner series, the 7 to 9 denticles of each tooth of the inner series of about equal size; maxillary with 2 similar serrate or three-pointed teeth and about 15 conical teeth scattered along its entire margin; dentary with about 6 teeth similar to those of the inner premaxillary series; the outermost (lateral) one much smaller, followed on sides by 6 canines, of which the first and last are small, the other 4 very large, recurved, on the elevated margin of the dentary. Lateral line complete; adipose fin well developed; origin of dorsal near middle of body. An examination of the mouth of the young and adult makes it difficult to believe that they belong to the same genus. In the young the first series of conical teeth of the premaxillary are not evident and the maxillary is short and rounded, reaching just beyond the origin of the eye. The maxillary grows out of proportion with the general increase in size, so that in the adult it extends to below the posterior margin of the eye and beyond. In the young it has but the one or two denticulated teeth near its angle, the conical teeth appear with growth. In a specimen 93 mm. long but five conical teeth are developed.

HABITAT.—San Juan and Patia Rivers of western Colombia.

## 1. PARASTREMMA SADINA Eigenmann.

Plate 72, figs. 1-6; Plate 74, figs. 5, 8, 10, 11, 12, 15, 16, 17;

Plate 77, figs. 9, 10, 12; Plate 94, fig. 4.

*Parastremma sadina* EIGENMANN, Indiana univ. studies, 1913, 16, p. 20; Mem. Carnegie mus., 1922, 9, p. 151.

HABITAT.—San Juan and Patia Rivers of western Colombia.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4812 C. Type	1		Istmina, San Juan Basin	Eigenmann
4813 C. } 12675 I. }	22	136 <sup>1</sup>	Istmina, San Juan Basin	Eigenmann
12972 I.			Rio Tado, San Juan Basin	Wilson
12973 I.	13		Istmina, San Juan Basin	Wilson
12974 I.	98		Condoto, San Juan Basin	Wilson
12967 I.	7		San Lorenzo, Rio Telembi, Patia Basin	Henn & Wilson
12968 I.	15		Rio Telembi, Patia Basin	Henn & Wilson
12969 I.	7		8 miles above Barbacoas, Patia Basin	Henn & Wilson
12970 I.	1	182 <sup>1</sup>	Creek Altacar, Patia Basin	Henn & Wilson
12971 I.	13		Trib. of Rio Telembi, Patia Basin	Henn & Wilson

Head 4.6; depth about 2.5; D. 11; A. 20-30; scales 11-55 to 63-10; eye 1 in snout, 3.5 in head, a little less than 2 in the interorbital.

Compressed; dorsal and ventral profiles equally arched, ventral and dorsal areas rounded; predorsal line in part naked, predorsal scales about 20. Head subconical, snout blunt, extending slightly beyond mouth; skull arched in cross section; frontal fontanel short, triangular, about twice as long as its width; occipital process bordered by about 5 scales on each side, extending about one sixth the distance from its base to the dorsal; cheek triangular, entirely covered by the third suborbital; preopercle prolonged, rounded below; mouth large, maxillary-premaxillary border angulate, at least as long as snout and eye; maxillary slender, extending to or beyond suture between second and third suborbital, becoming much longer with age; as long as snout and eye in the largest; dentition as described for the genus.

Gill-rakers short, 6 + 8 rakers, the longest raker 4 in the eye.

<sup>1</sup> Largest specimen.



Origin of dorsal midway between snout and caudal, the fin pointed, the fifth ray longest, reaching beyond origin of the caudal in the old, much shorter in the younger; caudal lobes about 4 in the length; anal long, its origin on a vertical from the last dorsal ray, or a little farther forward, its second to sixth rays forming a slight lobe, thence graduated; ventrals not reaching anal in smaller, to the 4th ray in the largest; pectorals narrow, not reaching ventrals or just reaching ventrals in the largest.

Scales cycloid, with few diverging striae; upper part of sides with scales regularly imbricate, below lateral line slightly less so; caudal naked; a series of very small scales along base of anal anteriorly; a large axillary scale; lateral line straight and complete.

A large subcircular spot on caudal peduncle conspicuous in young, becoming obscure with age; double humeral spots, vertically elongate, one across third and fourth, the other across tenth and eleventh scales of the lateral line; fins without black markings.

### 37. RHOADSIA Fowler.

*Rhoadsia* <sup>1</sup> FOWLER, Proc. acad. nat. sci. Phila., 1911, p. 497.

*Carlia* MEEK, Field mus. publication, 1914, **174**, p. 108 (*eigenmanni*).

TYPE.—*Rhoadsia altipinna* Fowler.

With the character of *Parastremma*, the lateral line incomplete.

HABITAT.—Costa Rica and western Ecuador.

#### *Key to the Species.*

- a.* A large black spot on the middle of the sides below the end of the dorsal; caudal plain. Depth 2.25.  
1. *altipinna* Fowler.
- aa.* Similar but depth 2.8-3. . . . . 2. *minor* Eigenmann & Henn.
- aaa.* A rounded black spot on and over the 8th and 9th scales of the lateral line; a black band on the caudal peduncle, fading out forward and continued to the end of the middle rays. Depth 2.66.  
3. *eigenmanni* (Meek).

#### 1. RHOADSIA ALTIPINNA Fowler.

Plate **73**, fig. 3; Plate **74**, figs. 1, 2, 3, 4, 6, 9, 13, 14; Plate **77**, figs. 11, 13, 14; Plate **94**, fig. 3.

*Rhoadsia altipinna* FOWLER, Proc. acad. nat. sci. Phila., 1911, p. 498, fig. 2 (Chimbo River, near Bucay, Prov. Guayas, Ecuador); EIGENMANN, Mem. Carnegie mus., 1922, **9**, p. 154.

HABITAT.—Rio Chan Chan, western Ecuador, up to about 800 feet.

<sup>1</sup> To S. N. Rhoads, mammalogist.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
A. N. S. P. Paratype	1	—	Chimbo River	Rhoads
13001 L.	31	37-468	Naranjito, Ecuador	Henn
13717 L.	1	50	Chone, Prov. Manabi	Henn

Head 3.5-4; depth 2.25; D. 11; A. 28-31; scales 9-15 + 29-8; eye 1.8 in snout, 4.8 in head, 2.3 in interorbital in adult; 1 in snout, 3 in head, 1.1 in interorbital in half grown.

Deep, compressed; preventral area rounded, with about 25 scales, not in a regular median series; predorsal area narrow; the scales of the two sides more or less overlapping, the median line more or less naked, no median series of scales; occipital process about one fifth of the distance from its base to the dorsal, about 6 scales along its sides; interorbital very convex; frontal fontanel about 1.5 in the parietal; second suborbital covering the entire cheek; mouth, teeth, and maxillary very much modified with age; maxillary scarcely reaching the eye in the young; nearly to the suture between the first and second suborbital in specimens 95 mm. long, to below the posterior margin of the eye in the adult. Premaxillary and maxillary in the young each with five-pointed incisors, the points equal in size and forming a continuous serration in each jaw, the mandibular teeth pointing forward; maxillary with 2 teeth; teeth of the sides of the lower jaw recurved, conical except the most forward one, which is three-pointed. In the adult the maxillary has 20 conical teeth in addition to the 2 near the angle in which the median cusp has become much the larger, or the lateral cusps may have disappeared; the teeth of the premaxillary and anterior ones of the mandible may have become tricuspid, the median cusp being much the larger, the teeth wide apart, interlocking when the jaws are closed; the side of the mandible with several large conical teeth, the points of the anterior ones diverging. Two large conical teeth in each premaxillary in front are developed when 90 mm. is reached.

Gill-membranes united to below posterior margin of the eye; gill-rakers 12 + 14.

Origin of dorsal equidistant from tip of snout and base of middle caudal rays; fourth and fifth dorsal rays highest, reaching caudal; adipose well developed; caudal lobes 3.5 in the length; origin of anal below middle of dorsal, the rays high, an anterior lobe, the fourth ray sometimes reaching base of last; ventrals pointed reaching considerably beyond the origin of anal; pectorals to or beyond origin of ventrals.

Scales of the sides everywhere regularly imbricate; lateral line with pores on 15 to 18 scales; caudal naked; base of anal with an inconspicuous row of small scales on its base; axillary scale well developed.

Lower part of opercle black, the upper silvery white; a large black spot on the middle below the end of the dorsal.

## 2. *RHOADSIA MINOR* Eigenmann and Henn.

Plate 73, fig. 2.

*Rhoadsia minor* EIGENMANN & HENN, Indiana univ. studies, 1914, **24**, p. 231; EIGENMANN, Mem. Carnegie mus., 1922, **9**, p. 155.

HABITAT.—Western Ecuador, 4,900 feet.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
13419 I. Type	3	98-104	Rio Blanco, 4,900 feet	Henn
13420 I. Paratypes	88	10-59	Rio Blanco, 4,900 feet	Henn

“From small, crystalline brooks of the Rio Blanco at Mindo at an elevation (Reiss and Stübel) of 4,136 feet. Mindo consists of the large hacienda San Vicente, situated in the extremely humid sub-tropical forest of the western folds of Mt. Pichincha, draining to the Rio Esmeraldas.

“A brilliant little fish, locally known as ‘doradillo’ (little gilded one). I also heard of this little jewel, when in the hot dry valley of the Chota of northern Ecuador, near the irrigated sugar plantation ‘Cabuyal,’ here at an elevation of some 4,900 feet.” *Henn.*

Closely related to *R. altipinna* Fowler of the Chimbo-Chan Chan Basin of the Guayas system of Ecuador; *R. altipinna* is a much deeper and larger fish occurring probably not higher than the type-locality below Bucay, at an altitude of about seven or eight hundred feet. *R. minor* is a dwarf mountain form from over 4,000 feet. *Rhoadsia minor* is distinguished by its lesser depth, the relatively feeble dentition, more forward position of the dorsal, and size. There is scarcely any difference in number of scales. In mature specimens of *Rhoadsia* the maxillary extends to below the posterior margin of the eye. *Rhoadsia minor* is mature when 95 mm. is attained, and *R. altipinna* at 140 mm. A corresponding relation exists at all stages in the development of the maxillary. In specimens of *R. minor* 40 mm. long the maxillary extends to the vertical from the anterior corner of the orbit. In *R. altipinna* of the same size the maxillary is more slender and extends but slightly beyond the vertical from the posterior nares. In specimens of *R. minor* 56 mm. long the maxillary reaches the vertical from the anterior third

of eye; in *R. altipinna* of the same size, the maxillary reaches the vertical from anterior corner of the orbit. At 95 mm. *R. minor* is mature; *R. altipinna* has the maxillary reaching nearly to the suture between the first and second suborbitals.

Head 3.8; depth 2.8-3; D. 11; A. 28-30; scales 9-15 + 25-8; eye 1.2-1.4 in snout, 3.8-4 in head and 1.3-1.6 in interorbital in mature specimens. Gill-rakers 10 + 14.

Slender, compressed; profile oblique to end of occipital process, thence arched to dorsal. Predorsal area narrow, without a median series of scales, those of the two sides overlapping. Occipital process elongate, with five or six scales along its side.

Dorsal placed slightly in advance of middle of entire length, fourth and fifth rays longest, reaching to base of caudal; adipose well developed; origin of anal under last rays of dorsal, 4th to 7th rays prolonged, forming an anterior lobe; pectorals just to ventrals, the latter overlap considerably on the anal.

Scales regularly imbricate, lateral line developed on first 14 or 15 scales, caudal naked, one or two inconspicuous rows of small scales developed on about the first ten rays of the anal.

Teeth and maxillary greatly modified in development. Maxillary in young without teeth; a series of five-pointed incisors on the premaxillary opposing identical incisors in the mandible. Maxillary in mature specimens elongate, slender, reaching below vertical from posterior margin of the orbit. Maxillary in mature specimens with 13 conical, spike-like incisors arranged along the anterior margin and two tricuspid incisors near the upper angle. Teeth of the premaxillary in two series, the outer series consists of two conical teeth; the inner, of 5 tricuspid incisors. Each ramus of the mandible with 10 teeth. The two posterior conical and recurved, then 3 conical ones, of which the first is vertical, the anterior two slanting forward, then 5 tricuspid incisors in front, meeting the incisors of the premaxillary.

Coloration in life brilliant, the anal a combination of bright red and yellow, dorsal paler yellow. An oblong or deltoid spot of intense black in the mid-lateral line below the last rays of the dorsal. This spot often continued as a straight line to the base of the caudal. Very young specimens possess a circular spot on the base of the caudal. This becomes obsolete with age and is lost by the time a length of 40 mm. is attained. There is no indication of the lateral subdorsal spot in specimens less than 28 mm. long. An obscure, dark, oval, humeral spot behind operculum, followed by a vertical bar. Upper part of opercle silvery white, lower part deep black.

## 3. RHOADSIA EIGENMANNI (Meek).

Plate 73, fig. 1.

*Cheirodon eigenmanni* MEEK, Field mus. publication, 1912, **163**, p. 70.*Carlia eigenmanni* MEEK, Field mus. publication, 1914, **174**, p. 108.

HABITAT.—Costa Rica.

One specimen 73 mm. La Junta, Costa Rica. Meek.

Head 4.25; depth 2.66; D. 11; A. 31–33; scales 9–10 + 32<sup>1</sup>–8; eye 3; interorbital a little greater than the eye.

Compressed; subrhomboidal; preventral area narrow, with 15 scales in a nearly regular median series; predorsal area narrow, the middle line naked near the occipital process, with small scales scarcely covering the middle line nearer the dorsal; occipital process slender, equal to one fifth the distance from its base to the dorsal, bordered by about five scales; interorbital convex, the frontal fontanel little more than half the length of the second; second suborbital in contact with the preopercle below, maxillary equals length of the eye; five seven-pointed incisors in the premaxillary, no outer series of conical teeth; maxillary with two five-pointed incisors and 6 large conical teeth along the entire margin of the maxillary; mandible with 5 very broad nine-pointed incisors which overlap, and 4 conical teeth in an incurving series.

Origin of dorsal about equidistant from snout and middle caudal rays, its highest ray 2.5 in the length, reaching beyond origin of the adipose; origin of anal under middle of dorsal, its end behind the vertical from the adipose. Ventrals reaching past origin of anal, pectorals beyond origin of ventrals. Pores developed on ten scales; minute hooks along posterior half of the anterior anal rays in the male.

A humeral spot on and over the 8th and 9th scales of the lateral line; a conspicuous black band on the caudal peduncle, fading out forward and extending to the end of the middle caudal rays.<sup>2</sup>

## SUBFAMILY GLANDULOCAUDINAE.

In 1858 Gill described three genera of fishes from the island of Trinidad. Later studies have demonstrated that they represented respectively the male, female, and young of a single species, *Corynopoma riisei*. Lütken and Regan secured additional specimens, also from Trinidad. In 1913 the first specimens of

<sup>1</sup> Meek gives 46–48 in the entire series.

<sup>2</sup> This species is very likely generically distinct from *Rhoadsia*, in which case it would go by the name *Carlia eigenmanni*. G. S. Myers.

the genus taken outside of Trinidad were collected at the base of the Cordilleras east of Bogotá and they were described by me as *Stevardia aliata* in 1914.

In 1891, within a few weeks of each other, appeared descriptions of a fish from Montevideo, by Perugia, Steindachner, and Holmberg. Perugia's name had priority. Perugia recognized the relationship between his fish, *Pseudocorynopoma*, and *Corynopoma* from Trinidad. A pair of living *Pseudocorynopoma doriae* was given me by the aquarist, Paul Matte, of Berlin, and many specimens of this fish and of the *P. heterandria* were collected in southeastern Brazil by Mr. Haseman.

In 1894 Cope described *Diapoma speculiferum*, a peculiar little fish from Jacuhy in the Rio Grande do Sul. I am indebted to the authorities of the Academy of Natural Sciences of Philadelphia for the privilege of examining the type.

In 1908 Ribeiro described a little fish from southeastern Brazil, *Coelurichthys iporangae*. Its relationships were not pointed out by him. Dr. Ribeiro kindly lent me the type, and Mr. Haseman collected many specimens. It now appears that *iporangae* is a synonym of a fish described many years ago (1876) by Steindachner, *Paragoniates microlepis*. The proper name of the fish, then, is *Coelurichthys microlepis*,<sup>1</sup> as the type species of the genus *Paragoniates* belongs to the Cheirodontinae.

In 1911 I described *Hysteronotus megalostomus* from the Rio das Velhas, a tributary of the Rio San Francisco, and three species of *Glandulocauda* (*G. melanogenys*, *G. inequalis*, and *G. melanopleura*) from southeastern Brazil; all of them were collected by Haseman.

In December, 1912 I described three species of *Gephyrocharax* (*G. chococensis*, *G. caucanus*, and *G. melanocheir*) which I had collected in transandean Colombia. Two more species were added by Meek and Hildebrand, from Panama, in 1912 and 1916.

In June, 1913 I described the remarkable little *Pterobrycon landoni*, from a single specimen about an inch long I had taken out of a little rivulet at Boca de Raspadura, Colombia.

Two new species of *Coelurichthys* were added by Nichols in 1913. They appear to represent the male and female of a single species, probably identical with *C. microlepis*.

In March, 1914 in Indiana University Studies No. 20, I reviewed the subfamily as then known. *Coelurichthys* was incorrectly stated to have a complete lateral line, on page 35.

<sup>1</sup> It has recently been discovered that *Coelurichthys* is a synonym of *Mimagoniates* Regan, 1907. *G. S. Myers*.

Since that review but few species have been described. One of Meek and Hildebrand's *Gephyrocharax* appeared in 1916. Another was described by me from Lake Valencia in 1920, and still another is here added by Mr. Myers from the Rio Beni Basin, Bolivia.

Detailed study shows that these very diverse fishes, inhabiting the extreme northwest and extreme southeast corners of tropical South America are related, all of them possessing the technical characters enumerated below.

So far as known individual species of this subfamily have restricted distributions, which would point to the ready modification of the Glandulocaudinae under different environments. Five species of *Gephyrocharax* occupy contiguous territories in Colombia and Panama, and three species of *Glandulocauda* are found in as many rivers of southeastern Brazil. *Mimagoniates microlepis* and possibly *Pseudoeorynopoma doriae* are exceptions, being found over wider territory.

Of greatest interest is the *ability* to develop sexual dimorphism. In the majority of the characins the differences between the male and the female are not great. In the Glandulocaudinae, however, the males frequently are quite different from the females, and of *particular interest is the fact that this difference sometimes appears in one organ and sometimes in another*. The opercle in the males of one species is excessively modified; some of the scales in another, the fins in still others; and generally there is a glandular pouch with specially modified scales on the caudal fins of the males in all of the forms. In many of the species the lower caudal fulera of the males are modified and may be separated as a spur from the rest of the fin.

One group of genera (*Pterobrycon*, *Gephyrocharax* and *Corynopoma*) is found in northwestern South America, the first being, so far as known, found west of the eastern Cordilleras of Colombia. The remaining genera are found at the opposite corner of the tropical region of South America; that is to say, in southeastern Brazil and Uruguay. If they are found between these two regions they have so far not been observed there.

The distribution of the Glandulocaudinae indicates similar physical conditions or similar origin for the faunas of transandean Colombia and southeastern tropical South America.

Of like import is the distribution of the genus *Salminus*. One species is found west of the eastern Cordilleras of Colombia and the other one is found in the La Plata Basin. A somewhat similar condition is found in the distribution of the genera *Pseudochalecus* from western Ecuador and its nearest relative *Hollandichthys* from southeastern Brazil. Furthermore, the genus *Bryconamericus* finds

its greatest development along the Cordilleras of Ecuador and Colombia and in the La Plata basin to Rio Grande do Sul. Similarly, the species *Astyanax fasciatus* reaches its greatest development and has diverged into the largest number of varieties west of the eastern Cordilleras of Colombia and in southeastern Brazil.

There is evidence that the similarity between the faunas of the region west of the eastern Cordilleras of Colombia and the southeastern corner of the tropical regions of South America is not confined to positive resemblances, but that a number of types absent from northwestern Colombia are also absent from southeastern Brazil to Buenos Aires. The details in the distribution will be pointed out later.

A third point of general interest is the ability to produce a similar result by a very diverse means. "Adaptations arise whenever needed if they are at all possible." If we grant that it is desirable to have a movable spot near the middle of the body, then this desideratum has been reached in *Corynopoma* through the prolongation of its opercle; in *Pterobrycon* by the prolongation of a scale; in one species of *Pseudocorynopoma* and one of *Gephyrocharax* by tipping the pectoral with black or brown. (Permanent black spots near the middle have been accomplished by one species of *Rhoadsia* and one of *Vesicatrux*, members of other subfamilies.)

The mouth in all the species is oblique and the pectorals are large. In one species at least the fish swims below its prey and then by a wing-stroke of the pectorals lifts itself to the food.

In the related Tetragonopterinae the differences between genera consist largely in the different combinations of a comparatively few characters; in the Glandulocaudinae there is considerable originality, as may be seen in the key to the genera.

Premaxillary teeth notched, in two series, mandibulary-maxillary teeth in a single series.

Origin of dorsal usually distinctly behind the middle of the body except in *Glandulocauda melanopleura*; anal short or of moderate length; mouth very oblique, the lower jaw quite or nearly entering the profile; pectorals large, falcate, reaching beyond origin of ventrals, frequently to the anal; profile from dorsal to snout nearly straight, the ventral profile from chin to ventrals arched; second suborbital usually covering the entire cheek.

Sexual dimorphism very marked, the fins of the males frequently greatly exaggerated, the lower fulera in the male frequently separate from the rest of the lower caudal lobe; caudal in the male with peculiar glandular scales or pouches



covered by united scales, frequently split to the base in the middle; opercles or scales sometimes modified.

HABITAT.—Panama to the Pacific slope of Ecuador; the eastern slope of the Andes in the Upper Rio Beni Basin in Bolivia; eastward from Colombia to Venezuela and Trinidad; eastern (São Francisco) and southeastern Brazil (Parahyba to the Rio Grande do Sul); and Uruguay and Paraguay. Excepting in the Upper Beni, this subfamily has not been found in the Amazon Basin.

Through *Landonia*, *Argopleura*, *Acrobrycon*, and *Phenacobrycon*<sup>1</sup> this subfamily is allied to the Tetragnopterinae and through *Mimagoniates* and *Prionobrama* with the Cheirodontinae.

### *Key to the Genera.*

- a. Opercle in male prolonged into a style ending in a dermal flap over the anal; fins in males very large; dorsal and anal rounded; last anal ray in male prolonged; lateral line complete. No adipose fin. 38. *Corynopoma* Gill.
- aa. Opercle notched above, prolonged to a point below; adipose fin present; last anal rays higher than the middle; lateral line developed in front and near caudal, not in middle. . . . 39. *Diapoma* Cope.
- aaa. Opercle not prolonged.
  - b. A scale of the side prolonged, expanded into a dermal flap at its end similar to that of the opercle in *Stevardia*; dorsal and anal rounded; last anal ray greatly prolonged; adipose fin present; lateral line incomplete; gill membranes united. . . . . 40. *Pterobrycon* Eigenmann.
  - bb. Sides without prolonged scales.
    - c. Preventral area trenchant; dorsal and anal in male enlarged; lateral line complete, adipose fin present. . . . . 41. *Pseudocorynopoma* Perugia.
    - cc. Preventral area not trenchant, more or less narrowly rounded, adipose fin present.
      - d. Three lowest caudal rays separate from the rest of the fin in the male, the squamous pouch surrounding them and extending on the base of the lower caudal lobe only.
        - c. Anal with 30–34 rays, lateral line complete. . . . 42. *Gephyrocharax* Eigenmann.
        - ce. Anal 18, lateral line incomplete. . . . . 43. *Microbrycon* Eigenmann & Wilson.
      - dd. Lower caudal rays not separate in the male.
        - f. Squamous pouch in male on the lower half of caudal; lateral line complete; A. 31–32.
          - g. Maxillary and mandibular teeth notched, the middle point longest and most prominent. . . . . 44. *Hysteronotus* Eigenmann.
          - gg. Maxillary and mandible with very broad tipped teeth. . . . see *Landonia*.
        - ff. Squamous pouch in male on upper half of caudal; anal 26–34; lateral line incomplete.
          - h. Premaxillary teeth distinctly in two series, the teeth large and strong. 45. *Glandulocauda* Eigenmann.
          - hh. Premaxillary teeth in two indistinct series, or irregularly in one series, the teeth finer. . . . . 46. *Mimagoniates* Regan.

<sup>1</sup> Further study seems to show that these four genera, particularly *Landonia* and *Argopleura*, should be placed in the Glandulocaudinae. They have the peculiar habitus and light body color of the Glandulocaudinae, in addition to the characteristic caudal pouch of the male. *G. S. Myers*.

## 38. CORYNOPOMA Gill.

*Stewardia* GILL, Ann. lye. nat. hist. N. Y., 1858, 6, p. 63 (*albipinnis*); EIGENMANN, Indiana univ. studies, 1914, 20, p. 37.

*Corynopoma* GILL, Ann. lye. nat. hist. N. Y., 1858, 6, p. 65 (*riisei*); REGAN, P.Z.S., 1906, p. 382.

*Nematopoma* GILL, Ann. lye. nat. hist. N. Y., 1858, 6, p. 68 (*searlesii*).

TYPE.—*Corynopoma riisei* Gill.

Distinguished by the prolonged opercle in the male.

No adipose fin. Premaxillary teeth in two rows, maxillary and mandibular teeth in a single series.

Teeth compressed, with multicuspid crowns, the median cusp longest. Opercle prolonged into a sharp point in the female, into a pen in the male reaching to above the anal, expanded into a flap at its end.

Dorsal over the anal, its origin much nearer caudal than tip of head. Caudal deeply forked; lateral line present; body subfusiform, compressed; mouth moderate, oblique. Anal rays increasing or decreasing in height backward, or the last two rays prolonged.

HABITAT.—Trinidad, and base of the Andes east of Bogotá. Probably also in the intervening territory.

*Key to the Species.*

- a.* Last anal ray produced, beyond the rest, in both male and female; caudal in male divided to its base, the lower fulera separated from the fin, forming a spur; the basal scales of the lower lobe arching over a considerable cavity.....1. *aliata* Eigenmann.  
*aa.* Last anal ray not produced; caudal in male not divided, without a basal spur and without united scales covering a pouch.....2. *riisei* Gill.

## 1. CORYNOPOMA ALIATA (Eigenmann).

Plate 83, fig. 4; Plate 84, fig. 1.

*Stewardia aliata* EIGENMANN, Indiana univ. studies, 1914, 24, p. 37; Mem. Carnegie mus., 1922, 9, p. 238.

HABITAT.—Base of Andes east of Bogotá.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5489 C. Type	1 ♂	75	Villavicencio, Rio Negro	Gonzales
13180 I. Paratypes	20	77 <sup>1</sup>	Villavicencio, Rio Negro	Gonzales
5490 C. } Paratypes	3	51 <sup>2</sup>	Rio Guadrigua	Gonzales
13181 I. }				
7409 C.	5	31-44	Quebrada Cramalote, Villavicencio	Gonzales
13719 I.			Quebrada Cramalote, Villavicencio	Gonzales
13720 I.	26	25-70	Barrigona, Rio Meta	Gonzales

<sup>1</sup> Largest male.

<sup>2</sup> Largest specimen.

Head to upper angle of gill-opening 4.5–5 in the length; depth 3.5; D. 10; A. 24–28; scales 6–43–6; eye a little longer than snout, a little less than inter-orbital, about 3 in the head to the base of the opercular process.

Dorsal outline straight or but little curved; ventral outline regularly arched from the chin to the end of the base of the anal; preventral area rounded or narrowly keeled, without distinct median series of scales; predorsal area rounded, with about 20 scales in a median series; occipital process short, about  $\frac{1}{8}$  in the distance from its base to the dorsal, bordered by two scales on each side; frontal fontanel a minute pore, parietal fontanel narrow except at the base of the occipital process, where it is rhomboid; cheeks entirely covered by the second suborbital; maxillary-premaxillary about half as long as head to upper angle of gill-openings.

Mandible with 5 teeth, the second smaller than the first, rapidly graduated from the third which is nearly as large as the first; a few minute teeth on the sides; premaxillary with 2–4 teeth in the outer series and 5 in the inner; 2 or 3 teeth on the maxillary; teeth of the inner series of the premaxillary and of the front part of the mandible with a very large median cusp and two minute lateral cusps on each side.

Opercle in the female pointed, reaching to just above the base of the first pectoral ray; in the male prolonged in a style with an expanded dermal flap over the middle or posterior half of the anal; gill-rakers very short.

A few interpolated rows of scales from above the middle of the ventrals, the series deflected towards the anal; scales of the sides continued to form a sheath at the base of the anal; caudal in female naked, the scales at its base normal; scales of the lower caudal lobe of the male united and bulging over a large cavity between them and the caudal, the pouch open behind; each scale with a number of radials.

Fins very different in the two sexes; origin of dorsal equidistant from base of middle caudal rays and upper angle of gill-opening in the female, and the eye in the male; its height equal to length of head in female, greatly prolonged in the male, reaching beyond origin of caudal; no adipose fin; caudal forked in female, split to its base in the male, the lower lobe slightly longer than the upper in the female, 3.5 in the length, much longer in the male, 1.66 in the length; lower three caudal fulera in the male separated from the rest of the fin as in *Gephyrocharax*; origin of the anal in front of the vertical from the front of the dorsal, its margin in the female rounded to the last rays which are slightly longer, similar but much higher in the male, the last ray expanded at the tip, which extends to the end of the separate lower caudal fulera; ventral not reaching to the anal in the female,

to beyond its origin in the male, the next to the inner ray at least as long as the longest; pectorals in the males reaching to or beyond origin of the anal, a little shorter in the female.

Middle caudal rays dusky.

## 2. *CORYNOPOMA RIISEI* Gill.

Plate 83, figs. 2, 3.

- Stewardia albipinnis* GILL, Ann. lyc. nat. hist. N. Y., 1858, **6**, p. 65 (Trinidad); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438; Indiana univ. studies, 1914, **20**, p. 38.
- Corynopoma albipinne* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 287; EIGENMANN & EIGENMANN, Proc. Cal. acad. sci., 1889, ser. 2, **2**, p. 114; Proc. U. S. nat. mus., 1891, **14**, p. 46.
- Corynopoma riisei* GILL, Ann. lyc. nat. hist. N. Y., 1858, **6**, p. 66 (Trinidad); GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 287 (copied); LÜTKIN, Vidensk. medd. nat. for. Kjöb., 1874, p. 224; EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 46; Proc. Cal. acad. sci., 1889, ser. 2, **2**, p. 114; REGAN, P. Z. S., 1906, p. 382, pl. 22, fig. 3, 3a. (Trinidad).
- Corynopoma recdonii* GILL, Ann. lyc. nat. hist. N. Y., 1858, **6**, p. 67 (Trinidad); GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 287; EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 46; Proc. Cal. acad. sci., 1889, ser. 2, **2**, p. 114.
- Nematopoma searlesii* GILL, Ann. lyc. nat. hist. N. Y., 1858, **6**, p. 69 (Trinidad); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 46.
- Corynopoma searlesii* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 288; LÜTKIN, Vidensk. medd. nat. for. Kjöb., 1874, p. 222, fig. (Trinidad); EIGENMANN & EIGENMANN, Proc. Cal. acad. sci., 1889, ser. 2, **2**, p. 114.

HABITAT.—Trinidad.

I have not seen any specimens from Trinidad and it is possible that the peculiar characters mentioned for *C. aliata* in the key have been overlooked. In that case the Villavicencio specimens may be specifically identical with *C. riisei*. The following description is condensed from Regan's account.

Maximum length 45 mm.

Head 4.25–4.75; depth 3–3.5; D. 9–11; A. 25–30; scales 6 or 7–38 to 44–5 or 6; eye nearly equal to interorbital, much longer than snout, 2.33–2.5 in the head. Mouth small, very oblique, the maxillary nearly vertical, just in front of the eye. Teeth compressed, with strong median cusps and 1 to 3 smaller cusps on each side, in two series in the upper jaw, one in the lower. Opercle, in the female, with a short-pointed projection; in the adult male with a long, slender, curved process terminating in a compressed expansion at the level of the dorsal fin. Lateral line complete. Commencing above about the seventh anal ray; when laid back, in the female, not reaching nearly to the caudal, in the adult male, extending well beyond the base of caudal. Anal commencing at or a little behind the middle of the length of the fish; last ray, when laid back, in the female, not reaching the caudal, in the adult male, extending well beyond the base of the caudal. Pectorals and ventrals extending to or nearly to the origin of anal;

ventrals 7-rayed. Caudal deeply forked, the lobes equal in the female, the lower considerably produced in the adult male. Caudal peduncle  $1\frac{2}{3}$ –2 as long as deep. Olivaceous, with silvery reflections; a blackish stripe along the middle of the side; fins pale.

### 39. DIAPOMA Cope.

*διά*, intensive particle; *πῶμα*, *τό*, operculum.

*Diapoma* COPE, Amer. nat., 1894, **28**, p. 67; Proc. Amer. phil. soc., 1894, **33**, p. 92.

TYPE.—*Diapoma speculiferum* Cope.

Adipose fin present, operculum notched above, prolonged below; two rows of denticulate teeth on the premaxillary, one row on the mandible; dorsal behind ventrals; anal elongate; lateral line incomplete; caudal naked except for a patch of scales on the lower lobe (of the male only?); postventral region trenchant.

HABITAT.—Rio Jacuhy, Rio Grande do Sul.

#### 1. DIAPOMA SPECULIFERUM Cope.

Plate 61, fig. 4; Plate 67, fig. 2.

*Diapoma speculiferum* COPE, Proc. Amer. philos. soc., 1894, **33**, p. 92, pl. 5, fig. 4 (Rio Grande do Sul); FOWLER, Proc. acad. nat. sci. Phil., 1906, p. 334 (Jacuhy); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 438

HABITAT.—Rio Jacuhy, Rio Grande do Sul.

One specimen, 21580 type A.N.S.P. 35 mm. to base of caudal. Jacuhy, Smith.

Head to end of opercular 3.66 in the length; depth 3.4; D. 10; A. 32; scales 5–9+21+6–4; eyes 2 in the head without the opercle; interorbital not equal to the eye.

Compressed, slender; postventral area rounded; predorsal area with a median series of 14 scales.

Occipital process  $\frac{1}{8}$  in the distance from its base to the dorsal; bordered by two scales on the sides; fontanels wide, the frontal as long as the parietal without the groove; second suborbital covering the entire cheek; maxillary long and slender, as long as eye; 3 and 4 teeth in the outer series of the premaxillary, 4 in the inner series; maxillary with 4 teeth; 4 large teeth in the dentary in front and 3 to 5 small ones on the side.

Gill-rakers 6 + 12.

Scales eyeloid, regularly imbricate; a basal anal-sheath along the anterior

$\frac{2}{5}$  of the base, composed of a single series of scales; caudal naked. Lateral line developed on the first 9 or 10 and last 6 or 7 scales only.

Origin of dorsal considerably nearer caudal than snout; origin of anal under dorsal.

A silvery lateral stripe; a faint vertical humeral spot above the fourth scale of the lateral line; caudal plain. "Opercle most brilliantly refulgent."

#### 40. PTEROBRYCON Eigenmann.

*πτερον*, *τό*, wing; Brycon, a genus of characins from *βρυνω*, to eat greedily; winged Brycon, in allusion to the prolonged scale on the shoulder.

*Pterobrycon* EIGENMANN, Indiana univ. studies, 1913, **18**, p. 3.

TYPE.—*Pterobrycon landoni* Eigenmann.

Distinguished from all other characins by the nature of the fine and modified scale.

Premaxillary teeth in two series; maxillary and mandible with a single series of teeth. Dorsal and anal highest near the middle the last anal ray prolonged. One of the scales of the side much prolonged and ending in a black bordered flap.

Caudal naked, lateral line incomplete; gill-membranes united, separate from the isthmus; second suborbital covering the entire cheek; 4 teeth in the inner series of the premaxillary; maxillary with few teeth near its upper angle.

*Microbrycon minutus* is very likely the female of *Pterobrycon landoni*, in which case the latter name should be retained.

HABITAT.—Atrato Basin.

#### 1. PTEROBRYCON LANDONI Eigenmann.

Plate 67, fig. 4.

*Pterobrycon landoni* EIGENMANN, Indiana univ. studies, 1913, **18**, p. 3.

One specimen, 5051 C., 25 mm. long, a creek behind the town Boca de Raspadura.

Head 3.5; depth 4+; D. 10; A. 20 (the first four fulera); scales ?; lateral line incomplete; eye 2.5. About 18 scales in front of the dorsal.

Very slender, tapering from head to caudal; the caudal peduncle nearly twice as long as deep.

Mouth very oblique, second suborbital covering the entire cheek; gill-membranes united, free from the isthmus; premaxillary with 4 teeth forming an irregu-

lar outer series and 4 larger ones forming an inner series; maxillary with 2 teeth. Mandibles with 3 large teeth in front, abruptly smaller ones on the sides. Origin of dorsal equidistant from tip of snout and end of middle caudal rays, the fifth and sixth rays longest, not very minute; caudal deeply forked, the lower lobe the longer, more than a third of the length from the snout to caudal, the lower fulera separate, forming a spur (?); anal unique among the characins, the last ray prolonged to near second third of lower caudal lobe, the remainder of the fin shaped like the dorsal, the highest middle rays a little higher than the highest dorsal ray; ventrals truncate, fan-shaped, the tips of the rays protruding, the inner ray prolonged, reaching the base of the thirteenth anal ray; pectorals lanceolate, placed low, reaching to, or nearly to, the ventrals.

A scale on the left side of the body, the third from the median dorsal series and about the seventh from the head, prolonged into a slender rod nearly one third of the length from snout to caudal, reaching to near the origin of the anal where it is expanded into a two-lobed, black-margined flap; the corresponding scale on the right side of the body is broad and spatulate but not unduly prolonged; caudal naked, the scales at the base of the lower lobe forming a pouch.

Sides peppered; an oval black spot just above the base of the last anal rays, a streak from this toward caudal nearly free from chromatophores; a similar black spot at base of upper caudal rays.

#### 41. PSEUDOCORYNOPOMA Perugia.

ψευδῆς, false; κορυνη, club; πωμα, operculum. False corynopoma, a synonym of Stevardia.

*Pseudocorynopoma* PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2a, **10**, p. 646, fig. (*doriae*).

*Bergia* STEINDACHNER, Anz. K. akad. wiss. Wien, 1891, p. 173; Ichthyol. beitr., 1891, **15**, pl. 2, fig. 2 (*altipinnis* = *doriae*).

*Chalcinopelecus* HOLMBERG, Revista Arg. nat. hist., 1891, **1**, p. 190 (*argentinus* = *doriae*).

TYPE.—*Pseudocorynopoma doriae* Perugia.

Boulenger states that *Pseudocorynopoma* has priority over *Bergia*.

This genus is distinguished from all its relatives by the trenchant ventral surface. Mandible with a single, premaxillary with two, series of teeth; all teeth two or more pointed; dorsal very high; adipose fin present; gill-membranes not united; lateral line complete, little decurved.

The teeth in the inner series of the premaxillary are in increased number, 7, and give the impression that the double series of its relatives are being converted into an irregular single series such as is found in *Gasteropelecus*.

HABITAT.—Xivivica on the Rio Ribeira and Rio Grande do Sul, southeastern Brazil, to Buenos Aires and Paraguay.

*Key to the Species.*

- a. Anal in the male with an anterior lobe with narrow membranes and eight or nine (not counting the first two) broad rays with tubercles and 29-34 non-tubercle bearing rays; the margin of the fin simply emarginate or falcate; caudal divided to its base; dorsal reaching tip of adipose; pectorals, anal and caudal lobes not brown tipped; a black streak forward from anus; A. 37-44.  
 1. *heterandria* Eigenmann.
- aa. Caudal lobes brown edged in both sexes, anal in the male with an anterior lobe of very wide membranes and 7-10 narrow rays including the rudimentary ones, followed by a second much lower lobe of narrow membranes with 4-7 tubercle-bearing rays, 20-26 non tubercle bearing rays; the margin of the fin double concave; anterior dorsal rays reaching to about middle of caudal; pectorals beyond origin of anal; frequently tips of pectorals, of rays of anterior anal lobe as well as tips of caudal, in male, black. A. 32-41, rarely more than 37..... 2. *doriae* Perugia.

## 1. PSEUDOCORYNOPOMA HETERANDRIA Eigenmann.

Plate 83, fig. 1; Plate 84, fig. 4; Plate 97, fig. 5.

*Pseudocorynopoma heterandria* EIGENMANN, Indiana univ. studies, 1914, 20, p. 39.

HABITAT.—Xivivica, on the Rio Ribeira, São Paulo.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5222 C. Type	1♂	80	Xivivica	Haseman
5223 C. Paratypes	10	90-92 <sup>1</sup>	Xivivica	Haseman

Head 4.75; depth 2.66-2.9; D. 10; A. in males 2+8 or 9+29-34, total 40-44, sometimes 37 in females; scales 7-41 to 44-6; eye 0.8-1 in snout, 3-3.66 in the head, 1.25-1.33 in the interorbital; depth of caudal peduncle equal to its length.

Compressed, elongate; dorsal profile arched very little; ventral profile greatly arched from chin to end of anal; ventral surface compressed, knife-like, the scales not lapping over the mid-ventral line except in front of pectoral; predorsal area rounded, with a medial series of about 13 scales in front of the dorsal and about 9 irregularly placed scales in front of them. Occipital process very short, about  $\frac{1}{13}$  of the distance from its base to the dorsal; skull convex, frontal fontanel narrow and short, shallow longitudinal grooves over the eye; second suborbital covering the entire cheek; mouth large, very oblique; maxillary-premaxillary border about 2.5 in the head; premaxillary with an outer series of usually 3, rarely 4, teeth and an inner series of 7; maxillary with 2 or 3 teeth; mandible with 7 graduated teeth, the second below normal, the fifth to seventh decreasing very rapidly; several minute teeth on the sides.

Origin of dorsal much nearer base of caudal than to upper angle of the gill-

<sup>1</sup> 3 males, largest specimen 90 mm.; 7 females, largest specimen 92 mm.



opening; dorsal rounded, the seventh ray highest, reaching tip of adipose in the male, not to adipose in the female; adipose fin small; caudal divided to its base in the male; origin of anal in advance of the origin of the dorsal, emarginate in the female, falcate in the male, the rays forming the lobe (3–9th) with retrorse hooks; ventrals reaching to the anal in the male, much shorter in the female; pectorals to near anal in both sexes.

Lateral line complete, moderately decurved, axillary scale small; caudal naked except for a few scales at the base of the lower lobe; the skin at the base of the fin tumid, a large space arched over by united scales at the base of the lower rays just below the middle, the opening bordered by a leaf-like scale above and a twisted scale below and behind; scales regularly arranged except over and a little in front of the anal, the rows deflected and continued to form a loose sheath at the base of the anal.

A black spot on base of middle caudal rays; in male streak in front of anus black; lower lip dark; no other markings.

## 2. PSEUDOCORYNOPOMA DORIAE Perugia.

Plate 82, figs. 1–4; Plate 84, fig. 5.

*Pseudocorynopoma doriae* PERUGIA, Ann. mus. civ. storia nat. Genova, 1891, ser. 2a, **10**, p. 646, fig.; BOULENGER, Ann. mag. nat. hist., 1892, ser 6, **10**, p. 12; COPE, Proc. Amer. philos. soc., 1894, **33**, p. 86 (Jacuhy); BERG, Anales Nac. Buenos Ayres, 1895, **4**, p. 125 (Rio Plata; Rio Paraguay; Arroyo Miguelete, Montevideo); LAHILLE, Rev. mus. de la Plata, 1895, **6**, p. 7 (Canal Este; Arroyo del Gato); FOWLER, Proc. acad. nat. sci. Phil., 1906, p. 451 (Jacuhy).

*Bergia altipinnis* STEINDACHNER, Anz. k. akad. wiss. Wien, 1891, p. 173 (Montevideo); Sitzb. k. akad. wiss. Wien., 1891, **100**, p. 366, pl. 11, fig. 2.

*Chalcinopelecus argentinus* HOLMBERG, Revista Arg. nat. hist., 1891, **1**, p. 190 (Rio Paraguay, Buenos Ayres).

HABITAT.—La Plata Basin to Rio Grande do Sul.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5219 C.	7	75 <sup>1</sup>	Uruguayana	Haseman
5220 C.	7 ♂♂ 12 ♀♀	63 <sup>2</sup> 71 <sup>3</sup>	Cacequy	Haseman
5221 C.	23 ♂♂ 100 ♀♀	70 <sup>4</sup> 68 <sup>5</sup>	Cacheoira, Rio Jacuhy	Haseman

It is not certain that the specimens before me all belong to the species figured by Steindachner and Perugia. Both figure the dorsal and the anal as symmetrical, one gives the anal as 42, the other as 32. Neither saw the double lobing of the anal, the divided caudal, nor the glandular pouch in the caudal. There is,

<sup>1</sup> Largest a female.

<sup>2</sup> Largest male.

<sup>3</sup> Largest female.

<sup>4</sup> Largest male.

<sup>5</sup> Largest female.

however, no doubt about the generic identification and Perugia noticed the black caudal tips.

Head 4.25; depth 2.5–2.75; D. 10; A.  $\frac{32}{2}$ ,  $\frac{34}{3}$ ,  $\frac{35}{1}$ ,  $\frac{36}{3}$ ,  $\frac{37}{2}$ ,  $\frac{38}{1}$ ,  $\frac{41}{1}$ ; scales 7–41 to 43–6; eye 3–3½ in the head, 1.25 in interorbital; depth of caudal peduncle equal to its length.

Compressed; ventral profile much more strongly curved than the dorsal; profile from snout to dorsal nearly straight, angulated at the origin of the dorsal; entire ventral surface compressed, knife-like, without scales across the median line except near the isthmus, predorsal area rounded without a median series of scales; occipital process very short, skull convex, with longitudinal grooves above the eye; frontal fontanel very short and narrow, parietal club-shaped; second suborbital covering the entire cheek; mouth large, very oblique, maxillary-premaxillary border little less than half the length of the head; mandible with 6 graduated teeth (the second below the normal in size) and several minute ones on the sides; premaxillary with an outer series of 3 teeth and an inner series of 6 or 7; maxillary with 1 to 7 teeth. All the larger teeth with a strong median cusp and two lateral cusps.

Origin of dorsal about equidistant from base of middle caudal rays and upper angle of gill-openings or middle of eye; the margin truncate and the ends of the rays subequal in the female, the anterior four (beyond the rudimentary one) in the male variously prolonged, reaching to the middle of the caudal in extreme cases. Caudal lobes similar in the two sexes, the fin split to its base at the middle in the male; base of the rays just above the divide tumid; a cavity at the base of the rays just below the middle arched over by connected scales, the cavity open behind, the opening guarded by a leaf-like scale above and a firm, narrow scale curved so as to form the lower border and also the posterior border; anal simply emarginate in the female and younger males, in the mature males three lobed, the anterior lobe consisting of 7–10 narrow rays separated by wide membranes, the second to fourth rays highest, reaching beyond tip of last in extreme cases, the second lobe consisting of 4–7 rays bearing retrorse hooks along the posterior lateral face, the rays broader, the membrane narrower than on the first lobe, the remainder of the fin as in the female; ventrals short, not reaching anal; pectorals about to tips of ventrals in the female, to the anal in the male.

Lateral line complete, but little decurved; axillary scales small, caudal naked except as stated above for the males; scales with several radials, regularly imbricate except over and a little in front of where the rows are deflected toward the

anal and continued as a sheath of about three rows along the base of the anal but not attached to the fin.

Silvery, prolonged dorsal rays dusky; tips of caudal lobes with short oblique or brown bars; rays of anterior lobe of the anal of the male frequently black tipped; tips of pectorals in the male usually black.

#### 42. *GEPHYROCHARAX* Eigenmann.<sup>1</sup>

γέφυρα, ἡ, a bridge, and Charax, a genus of characins from χάραξ, ὁ, a palisade. A bridge between Paragoniates and *Hysteronotus*.

*Gephyrocharax* EIGENMANN, Indiana univ. studies, 1912, **16**, p. 23.

TYPE.—*Gephyrocharax chocoensis* Eigenmann.

Premaxillary teeth in two distinct series, 5 teeth in the inner series. Second suborbital covering the entire cheek. Caudal without glandular scales, the lower caudal fulera free and forming a peculiar spur in the male. Adipose fin present. Origin of dorsal nearer to caudal than to the eye, considerably behind the vertical from origin of anal; pectorals large, overlapping the ventrals. Frontal fontanel present or absent.

Evidently allied to *Hysteronotus*, *Pseudocorynopoma*, and *Microbrycon*.

HABITAT.—Eastern slope of the Andes in the region of the Rio Beni, Bolivia; the Atlantic and Pacific side of the western Cordilleras of Colombia and Panama; and westward to Lake Valencia, Venezuela.

#### Key to the Species.

- a. No frontal fontanel; larger species.
  - b. Deep, depth 3.6 or greater.
    - c. Tips of pectorals not black in males; no dark spot at base of first dorsal ray.
      - d. No humeral spot (a collection of dark chromatophores sometimes visible, but never distinct or vertically elongate). (San Juan and Atrato Basins, Colombia.)
        - 1. *chocoensis* Eigenmann.
      - dd. A somewhat vertically elongate humeral spot present (always visible as a distinct collection of dark chromatophores). (Region of the Rio Beni, Bolivia.)
        - 2. *major* Myers, sp. nov.
    - cc. Tips of pectorals usually black in males; a dark spot at base of first dorsal ray. (Magdalena Basin, Colombia.)
      - 3. *melanocheir* Eigenmann.
  - bb. Slender, depth 4; a distinct lateral dark streak; pectorals of males not black tipped. (Cauca Basin, Colombia.)
    - 4. *caucanus* Eigenmann.
- aa. A frontal fontanel (*intermedius* not examined); smaller species.
  - e. Caudal spot distinctly continued out on the outer caudal rays and less so on the central rays. (Both slopes of Panama.)
    - 5. *atracauleatus* Meek and Hildebrand.
  - ee. Caudal spot not continued on the outer caudal rays (caudal slightly shaded in *valencia*).
    - f. A distinct humeral spot or bar. (Panama.)
      - 6. *intermedius* Meek and Hildebrand.
    - ff. No humeral spot. (Region of Lake Valencia, Venezuela.)
      - 7. *valencia* Eigenmann.

<sup>1</sup> This genus revised by G. S. Myers. Descriptions of *G. major* and *G. valencia* by the same author.

1. *GEPHYROCHARAX CHOCOENSIS* Eigenmann.

Plate 63, fig. 1; Plate 97, fig. 3.

*Gephyrocharax chocoensis* EIGENMANN, Indiana univ. studies, 1912, 16, p. 23; Indiana univ. studies, 1914, 20, p. 41; Mem. Carnegie mus., 1922, 9, p. 155.

HABITAT.—Atrato and San Juan Basins.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4806 C. Type	1	53	Istmina, San Juan Basin	Eigenmann
4807 C. } 12671 I. }	36	70 <sup>1</sup>	Istmina, San Juan Basin	Eigenmann
5357 C. } 13032 I. }	65	65 <sup>1</sup>	Istmina, San Juan Basin	Wilson
5358 C. } 13033 I. }	4	54 <sup>1</sup>	Creek near mouth of Rio Calima, San Juan Basin	Henn
5359 C. } 13034 I. }	6	66 <sup>1</sup>	Condoto, San Juan Basin	Wilson
5360 C. } 13035 I. }	2	—	Manigru, Atrato Basin	Wilson
	35	47 <sup>1</sup>	Truando, Atrato Basin	Wilson

Head 4.66; depth 3–3.25; D. 10; A. 30; scales 6–42–4.5; eye .75 in snout, 3 in head, 1.2 in interorbital.

Compressed; ventral profile regularly arched; dorsal profile to dorsal much more gently arched, slightly depressed over the eye. Predorsal area rounded, having about seventeen scales not forming a regular series; preventral surface narrowly rounded, postventral trencbant; breast broad, but with median ridge. Frontals meeting in a sinuous suture; no frontal fontanel; parietal fontanel rhomboidal as in *Hysteronotus*. Third suborbital covering entire cheek. Maxillary-premaxillary border angulate, about  $2\frac{1}{3}$  in length of head; maxillary with a single tooth; premaxillary with an outer series of 4 and an inner of 5 teeth; dentary with 4 or 5 large teeth, followed by abruptly minute teeth. Gill-rakers 4+11, all very short, those of the upper arch mere points.

Dorsal originating midway between the center of the caudal base and a spot approximately an eye diameter behind the opercle edge; originating a little further forward in the young. Distance from dorsal origin to caudal base 2.6 to 2.7 in the length without caudal.

Dorsal rounded or truncate, the highest ray extending little beyond tip of penultimate, not reaching the adipose; caudal forked, the lobes about equal,  $3\frac{1}{2}$

<sup>1</sup> Largest specimen.

in the length, lower fulera in the male separate from the rest of the lower caudal lobe, stiff, lancet-shaped; anal beginning far in advance of the dorsal, the anterior rays high, but the fin not falcate, the anal very slightly emarginate. Ventrals small, not reaching the anal; pectorals large, falcate, extending beyond origin of ventrals, 4 in the length.

Scales cycloid, those above lateral line and above posterior half of anal in regular, longitudinal series, those over the abdomen and above anal anteriorly in decurrent series; each scale with several divergent radii; axillary scale well developed; caudal sheath (♂) unique, two-pronged, at base of lower caudal lobe, the upper prong longer and broader, the lower forming a sheath for the detached fulera; scales of side continued to form a basal anal sheath; fins otherwise naked.

Stomach coecal, six pyloric coeca, the entire alimentary canal shorter than the entire fish.

A silvery lateral band; a large black spot covers middle of caudal peduncle and base of middle caudal rays; anal dusky; dorsal dusky but the anterior rays free from black pigment.

## 2. GEPHYROCHARAX MAJOR Myers, sp. nov.

*Gephyrocharax chocoensis* (non Eigenmann) Pearson, Indiana univ. studies, 1925, **64**, p. 46 (Rurrenabaque, Tumupasa, Popoi River, Ixiamas, Huachi).

HABITAT.—Region of the Rio Beni, Bolivia.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
17289 I.	32	50-62	Rurrenabaque	N. E. Pearson
17290 I.	16	50-63	Tumupasa	N. E. Pearson
17291 I. Cotypes	9	43-68	Popoi R., Upper Beni	N. E. Pearson
17292 I.	6	53-70	Ixiamas	N. E. Pearson
17293 I.	1	54	Huachi	N. E. Pearson

Head 4.2 to 4.4; depth 3.2 to 3.5; D. 10; A. 33; scales 40 to 41 + 3 lateral; 14 from dorsal to pelvic fins, lateral line row eighth below dorsal; eye .66 in snout, 3 in head, 1.1 in interorbital.

Maxillary with one tooth at its upper end. Premaxillary with 3 or 4 teeth on each side in the first row, the last directed outward, tusk-like; 4 or 5 teeth in the second row on each side. Dentary with 4 or 5 large teeth followed by abruptly smaller ones. No frontal fontanel. Great suborbital covering the entire cheek.

Dorsal originating midway between the caudal base and the vertical of the opercular or preopercular edge. Distance between the dorsal origin and the caudal base 2.45 in the length without caudal.

No black spot at the base of the first dorsal rays. Tips of pectorals not black in males.

This species is so near *G. chocoensis* that a more detailed description is unnecessary. From that species it differs in the presence of a humeral spot, in the slightly longer anal, and in the more anterior dorsal. It is larger than any of the other species in the genus. Pearson's measurements, given in the list of specimens above, were taken without the caudal. Measuring to the caudal tip, as in the rest of this volume, the largest reach 80 mm.

This, the largest form of *Gephyrocharax*, may readily be distinguished from *G. chocoensis* by the humeral spot and the more anterior dorsal.

### 3. GEPHYROCHARAX MELANOCEIR Eigenmann.

#### Plate 63, fig. 3.

*Gephyrocharax melanoceir* EIGENMANN, Indiana univ. studies, 1912, **16**, p. 24; Indiana univ. studies, 1914 **20**, p. 41; Mem. Carnegie mus., 1922, **9**, p. 156.

HABITAT.—Magdalena Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4839 C. Type	1 ♂	44	Bernal Creek at Honda	Eigenmann
4840 C. } 12696 I. }	23 <sup>1</sup>	46 <sup>2</sup>	Soplaviento	Eigenmann
4841 C. } 12697 I. }				
	7 <sup>3</sup>	48 <sup>2</sup>		Eigenmann

Head 4.25; depth 3–3.3; D. 10; A. 31; scales 6–39 to 41–4 or 5; eye .75–.9 in snout, 3 in head, very little less than interorbital.

Very similar in shape and general appearance to *G. chocoensis*. The females are scarcely distinguishable, but have distinct vertical humeral spot and the bases of the two first dorsal rays are dusky. The males are quite different from those of *G. chocoensis*: the bases of the two first dorsal rays are blackish, the pectorals instead of being falcate, as in *G. chocoensis*, have the tips of the second and sometimes the third ray expanded; usually the tip of second ray is black, sometimes there are supplementary, smaller black dots near the larger, ocellus-like black tip.

<sup>1</sup> 9 males, 14 females.

<sup>2</sup> Largest specimen.

<sup>3</sup> 3 males, 4 females.

Ten males from Bernal Creek have the black pectoral tip; only one of the three males from Soplaviento has the tip of the pectoral black; the pectorals in males are longer than in the other two species of the genus, sometimes quite reaching the anal, the lower modified fulera of caudal are also different. The lower one of the two modified fulera is slender and curved, its upturned tip only in contact with the tip of the heavier down-curved second fulerum; the fulera not covered with scales, but the scales at base of lower caudal lobe united and free from the caudal, leaving a pouch between them and the caudal.

#### 4. *GEPHYROCHARAX CAUCANUS* Eigenmann.

Plate 63, fig. 2; Plate 88, figs. 4, 5.

*Gephyrocharax caucanus* EIGENMANN, Indiana univ. studies, 1912, 16, p. 24; Indiana univ. studies, 1914 20, p. 41; Mem. Carnegie mus., 1922, 9, p. 155.

HABITAT.—Upper Cauca Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
4802 C. Type	1 ♀	62	Cartago	Eigenmann
4803 C. } 12668 I. { Paratypes	36	—	Cartago	Eigenmann
4804 C. } 12669 I. { Paratypes	15		Paila	Eigenmann
4805 C. } 12670 I. { Paratypes	7		Cali	Eigenmann

Head 5; depth 4; D. 10; A. 34; scales 5–44–5; eye equal to snout or to inter-orbital, 3.3 in head.

Compressed, much slenderer than any of the other species. Dorsal outline very little arched, the ventral much more so; predorsal area rounded, about 20 scales not arranged in a regular median series; preventral area narrowly rounded, postventral keeled but obscured in gravid females; breast narrow, with distinct median ridge; fontanel long, narrow; a minute frontal fontenal; third suborbital covering entire cheek; snout pointed, the lower jaw heavy; maxillary-premaxillary border angulate, about 2.5 in the head; no teeth on maxillary; premaxillary with 3 teeth in outer series, 4 teeth in the inner. Mandible with 3 large teeth on each side followed by minute ones on the side.

Gill-rakers 5 + 11. Dorsal rounded, not nearly reaching adipose; caudal lobes about equal, 4.5 in the length, lower fulera in male, free, spinous; origin of dorsal about midway between middle of pectoral and caudal; anal slightly emarginate,

its origin about midway between caudal and eye (its first ray in the male sometimes short, spinous, free [and erect?]). Ventrals reaching anus, pectorals to middle of ventrals, 4 in the length.

Scales thin, cycloid, easily lost; caudal naked, no caudal sheath in the males; scales of the sides continued on the anal rays at base.

Silvery, a bright lateral band underlaid with black ending in a spot on caudal peduncle and base of the middle rays; no humeral spot.

Evidently taken near the breeding season (March, 1912), mostly females.

This species differs notably from its Pacific slope relatives in its more elongate form, heavier lower jaw, and more oblique mouth.

## 5. *GEPHYROCHARAX ATRACAUDATUS* Meek and Hildebrand.

Plate 63, fig. 4.

*Deuterodon atracaulata* MEEK and HILDEBRAND, Field mus. publ., 1912, **158**, p. 68 (Rio Frijoles, Canal Zone, Panama).

*Gephyrocharax atricaulata* EIGENMANN, Indiana univ. studies, 1914, **20**, p. 41; MEEK and HILDEBRAND, Field mus. publ., 1916, **191**, p. 277 (Streams on both slopes of Panama, except Rio Chame); EIGENMANN, Mem. Carnegie mus., 1922, **9**, p. 156; BREDER, Bull. Amer. mus. nat. hist., 1927, **57**, p. 125 (Rio Chuncunaque, Darien).

HABITAT.—Both slopes of Panama, except the Rio Chame.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
Field Mus. Types	3	about 45-50	Rio Frijoles	{ Meek and
14028 I.	2	40-41	Rio Gatun, Monte Liria	{ Hildebrand

Head 4-4.25; depth 3; D. 10; A. 30; scales 6-36-6; eye not quite three in the head, a little less than the interorbital.

Elongate, compressed; dorsal profile nearly straight to the dorsal; ventral profile a regular arch to the origin of the anal; frontal fontanel linear, parietal linear in front, wide at base of occipital process; 3 to 5 teeth in the outer series of the premaxillary, 5 in the inner; a single small tooth on the maxillary; mandible with 4 large teeth, the last one recurved, about 7 minute teeth on the sides; mouth very oblique, snout pointed; maxillary but little shorter than the eye. Cheeks entirely covered by the second suborbital.

Scales with numerous nearly parallel radials, lateral line decurved; origin of dorsal nearer to the base of the middle caudal rays than to the head, behind the vertical from the origin of the anal; ventrals nearly reaching anal; pectorals considerably beyond the origin of ventrals.



Base of caudal black, the black extending a little way along the middle caudal rays and more conspicuously along the margin of the fin. A vertical humeral bar crossing the third and fourth scales of the lateral line.

6. *GEPHYROCHARAX INTERMEDIUS* Meek and Hildebrand.

*Gephyrocharax intermedius* MEEK and HILDEBRAND, Field mus. publ., 1916, **191**, p. 278 (Rio Chame); EIGENMANN, Mem. Carnegie mus., 1922, **9**, p. 156.

HABITAT.—Rio Chame, Panama.

“Head 4 to 4.5; depth 3.1 to 3.55; D. 9 or 10; A. 26 to 31; scales 39 to 43.

“Body elongate, rather strongly compressed; dorsal profile anteriorly straight or slightly concave; ventral outline strongly convex; abdomen round in advance of ventrals, keeled from ventrals to vent; head compressed; snout blunt, 3.7 to 5 in head; eye 2.6 to 3.4; interorbital 2.5 to 3; mouth small, strongly oblique; the lower jaw a little in advance of the upper; maxillary reaching slightly past anterior margin of eye; second suborbital broad, with its lower posterior angle rather sharp, often forming almost a right angle; teeth as in *G. atricaudata*; lateral line complete, curved downward anteriorly; scales striate, 18 to 20 in median series in advance of dorsal; 5 or 6 complete rows between lateral line and base of dorsal; the rows below lateral line abruptly bent downward and backward toward the base of anal, 5 scales in vertical series between lateral line and base of anterior rays of anal; the last scale on lower lobe of caudal much enlarged in males, with a hollow space or pocket underneath, its upper edge attached to the seventh ray of caudal; dorsal fin inserted posteriorly, its origin somewhat nearer base of caudal than margin of opercle; adipose fin about midway between base of last ray of dorsal and base of upper ray of caudal; caudal fin forked, the lower lobe the longer, its lower fulcrum free, forming a flat spur at margin of the enlarged scale of each side; anal fin long, its origin in advance of dorsal, about midway between anterior margin of eye and base of caudal; ventral fins reaching nearly or quite to origin of anal; pectoral fins long, overlapping the ventrals, inserted notably nearer tip of snout than origin of anal.

“Color pale green above, with a dark vertebral band; sides silvery. A faint silvery lateral band usually present; a distinct shoulder spot or bar. Fins reddish yellow; a large oval caudal spot, which does not extend either on the middle or the outer rays of the caudal.” *Meek and Hildebrand*.

“Related in color to *G. chococensis* and in structure to *G. atricaudata*.”

Presumably with a frontal fontanel.

## 7. GEPHYROCHARAX VALENCIA Eigenmann.

*Gephyrocharax valencia* EIGENMANN, Indiana univ. studies, 1920, **44**, p. 11 (Lake Valencia).

*Gephyrocharax valenciæ* (sic!) PEARSE, Univ. Wis. studies sci., 1920, **1**, p. 21 (Lake Valencia).

HABITAT.—Region of Lake Valencia, Venezuela.

*Specimens examined.*

Catalogue number	Number of specimens	Locality	Collector
15129 I.	many, paratypes	Isla del Buro, L. Valencia	A. S. Pearse
15130 I.	2, paratypes	Macaray, Rio Bue	A. S. Pearse
15131 I.	Type and 3 paratypes	Macaray, off Paper-mill dock	A. S. Pearse

Head 4.33; depth 3.33 to 3.66; D. 9; A. 30 to 32; scales 6 to 6.5–40 to 42–5; eye longer than snout, 3 in head, slightly less than interorbital.

Each side of the first row of the premaxillary with 2 or 3 teeth, 4 in the second series. Maxillary with a single tooth at its upper end. Dentary with 4 strong teeth followed by a series of minute teeth. Frontal fontanel present. Great suborbital covering entire cheek.

Dorsal originating midway between a point an eye diameter behind opercle edge and caudal base. Distance from caudal base to dorsal origin 2.7 in the length without caudal.

Reaching 49 mm. in total length.

Jaws tipped black. Males' pectorals not black tipped. A silvery lateral band underlaid with black, ending in a caudal blotch which does not extend upon the outer rays. Caudal, dorsal, and anal shaded with dark. No humeral spot.

Allied to the two other smaller species of *Gephyrocharax*, *G. atracaudatus* and *G. intermedius*, differing from the former in the caudal spot, from the latter in the absence of the humeral spot, and from both in the shorter snout.

## 43. MICROBRYCON Eigenmann and Wilson.

*μικρος*, small; Brycon, a genus of characins, from *βευκω*, to eat greedily, a minute Brycon.

*Microbrycon* EIGENMANN and WILSON, Indiana univ. studies, 1914, **19**, p. 3.

TYPE.—*Microbrycon minutus* Eigenmann and Wilson.

Very similar to *Gephyrocharax*, the lateral line incomplete and the anal much shorter. It is quite possible that *M. minutus* will prove to be the female of *Pterobrycon landoni*.

HABITAT.—That of its single species.

## 1. MICROBRYCON MINUTUS Eigenmann and Wilson.

Plate 89, fig. 1.

*Microbrycon minutus* EIGENMANN and WILSON, Indiana univ. studies, 1914, 19, p. 3.

HABITAT.—Atrato Basin, Colombia.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5422 C. Type	1	24	Truando, tributary of Rio Atrato	Wilson
13109 I. Paratype	1	24	Truando, tributary of Rio Atrato	Wilson

Head about 3.66; depth 3.5; D. 10; A. 18; scales about 32; eye equals inter-orbital, 2.5 in head.

Skull broad, the fontanels linear, expanding into a rhomboid at the last occipital process; second suborbital narrow, covering the entire cheek; mouth large, oblique; maxillary two thirds as long as eye, with one tooth; premaxillary with 4 teeth in the outer series, 5 in the inner; lower jaw with about 11 teeth on the sides, most of which are minute, conical; 4 larger teeth in front, of which the first and third are the largest.

Origin of dorsal about one and a half times as far from the snout as from the caudal, its highest ray shorter, the caudal lobes longer than the head; adipose well developed; anal comparatively short, its origin but little in front of the vertical from the front of the dorsal; ventrals reaching or not quite reaching origin of anal, pectorals to posterior third of ventrals; anal emarginate, its last ray considerably produced.

Scales thin without apparent lines. Caudal and anal naked.

A black line along the sides; a large spot at base of caudal; a few chromatophores along base of anal; back with scattered chromatophores, without black median line.

## 44. HYSTERONOTUS Eigenmann.

ὑστερον, later, νῶτον, τό, the back. The posterior position of the dorsal fin.

*Hysteronotus* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 171.

TYPE.—*Hysteronotus megalostomus* Eigenmann.

Mouth large, premaxillary teeth in two distinct series; 5 or more teeth in the inner series of the premaxillary; second suborbital covering the entire cheek; lower caudal rays in the male not separated from the rest, without glandular

scales; lateral line complete; adipose fin present; origin of dorsal nearer to caudal than to eye, considerably behind the vertical from the origin of the anal. Fontanels linear except at the base of the occipital process.

HABITAT.—São Francisco Basin.

# 1. HYSTERONOTUS MEGALOSTOMUS Eigenmann.

Plate 58, fig. 4.

*Hysteronotus megalostomus* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 171; Indiana univ. studies, 1914, 20, p. 42.

HABITAT.—Rio das Velhas, São Francisco Basin.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3551 C. Type	1	45	Rio das Velhas	Haseman
3552 C. Paratypes	6	27-40	Rio das Velhas	Haseman

Head 4; depth 3.33; D. 10; A. 35-36; scales 7-42-5 (10 to ventrals, about 8 to anal); eye 3, interorbital 2.6 in the head.

Compressed, short-snouted, pectorals falcate, chest somewhat ridged, approaching on one side some of the Characinae and on the other some of the Aphyocharacinae in appearance.

Ventral area narrowly rounded; predorsal area rounded, with about twenty-five scales, not definitely arranged in a median series; occipital process forming a nearly equilateral triangle, its length about one twelfth of the distance from its base to the dorsal, bordered on the side by two scales; fontanels reduced to a just perceptible slit except at the base of the occipital process, where the parietal fontanel is an equilateral rhomboid of which the two margins of the occipital process form two sides; interorbital with lateral grooves, scarcely convex in the middle; second suborbital in contact with the lower margin of the preopercle along its entire length, a narrow naked corner behind its upper posterior angle; mouth large, the premaxillary-maxillary border forming a continuous curve whose length is about half the length of the head. Snout pointed, premaxillary with an outer row of 3 teeth and an inner row of 6 or 7; maxillary quite slender, with 3 or 4 teeth; dentary with 5 or 6 larger teeth and a number of smaller ones on the sides; of the larger ones the first and third or fourth are largest; all the teeth except the last ones on the dentary *tricuspid*, the cusps all sharp, the middle one longest.

Gill-rakers very slender, 4 + 12, those on the upper arch very much shorter than those near the angle of the lower arch, which are about one fourth of the eye in length.

Dorsal rounded, its origin about equidistant from eye and middle caudal rays, its highest ray about 4.5 in the length; adipose dorsal well developed; caudal deeply forked, the lobes 3.5 in the length; anal, its origin a little nearer the snout than the base of the middle caudal rays; ventrals small, just reaching the anal; pectorals large, falcate, sometimes reaching to the anal.

Scales regularly arranged on the caudal peduncle, less regularly arranged on the sides above the lateral line; below the lateral line with many interpolated rows, so that the series run obliquely downward; anal with a sheath of two series of scales along its base in front; caudal naked, sometimes a slight swelling on the bases of the rays just above and just below the middle; radial striae short or none.

Cheeks and opercles highly iridescent; a well-developed humeral bar; no caudal spot, the middle rays dusky.

#### 45. GLANDULOCAUDA Eigenmann.

*Glandula*, a small gland; *cauda*, tail. In allusion to the gland on the base of the caudal.

*Glandulocauda* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 168.

TYPE.—*Glandulocauda melanogenys* Eigenmann.

Premaxillary with two distinct series of teeth. Four, rarely 5 teeth in the inner series of the premaxillary, second suborbital covering the entire cheek; caudal naked, a few scales forming a flap on the base of the rays just above the middle of the fin; lateral line short; adipose fin present; origin of dorsal nearer middle caudal rays than to snout. Allied to *Bryconamerieus*, *Coelurichthys*, and *Hyphessobrycon*.

HABITAT.—Southeastern Brazil. One in eastern São Paulo, one in Rio Grande do Sul, one in the upper Iguassú.

#### *Key to the Species.*

- a. Much compressed, deep; depth of caudal peduncle greater than its length; origin of anal and dorsal about equidistant from snout.
  - b. A. 26; scales 8-40-7 or 8; teeth five-pointed; cheeks dark; lateral line with 11-17 pores.
    - 1. *melanogenys* Eigenmann.
  - bb. A. 27-33; scales 7-38-6; teeth three-pointed; cheeks silvery; lateral line with 6 or 7 pores.
    - 2. *inqualis* Eigenmann.
- aa. Less compressed; depth of caudal peduncle less than its length; origin of dorsal in advance of that of the anal; A. about 20; depth 3.33; scales 5-33-5; lateral line with 5-7 pores.
  - 3. *melanopleura* Eigenmann.

## 1. GLANDULOCAUDA MELANOGENYS Eigenmann.

Plate 59, fig. 2; Plate 97, fig. 6.

*Glandulocauda melanogenys* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 168; Indiana univ. studies, 1914, 20, p. 42.

HABITAT.— Eastern São Paulo, Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3553 C. Type	1	49	Alto da Serra, São Paulo	Haseman
3554 C. Paratypes	21	29–51	Alto da Serra, São Paulo	Haseman

Head 4; depth 2.75–3.33; D. 10; A. 26; scales 8–40–7 or 8; eye in adult 3 in head, equal to the interorbital.

Compressed, deep in adult, more elongate in young; preventral area rounded, without a distinct median series of scales; predorsal area narrowly rounded, with about fifteen scales in a median series. Head smooth, rounded above; frontal fontanel considerably narrower and shorter than the parietal; second suborbital in contact with the preopercle along its entire lower margin, with a naked interspace behind; premaxillary-maxillary border, with a slight angle, 2.5 in the head; lower jaw short, heavy, with a prominent chin which is the most anterior part when the mouth is closed; premaxillary with an outer series of 2 or 3 teeth and an inner series of 4; maxillary with 3 or 4 teeth; dentary with 4 large teeth and several minute conical ones on the side. Large teeth of the dentary, the maxillary teeth, and those of the inner series of the premaxillary *five-pointed*.

Gill-rakers 6+9.

Dorsal rounded, its origin variable, but always nearer the caudal than to the snout, its highest ray about 4.5 in the length; caudal short and broad, about 4 in the length; anal emarginate, its origin about midway between the base of the middle caudal rays and the middle of the eye; ventrals just reaching the anal; pectorals more or less beyond origin of the ventrals; caudal fulera sometimes turgid.

Scales regularly arranged, no anal sheath; a few scales forming a flap at the base of the rays just above the middle of the caudal. Lateral line developed in 11–17 pores.

Cheeks and opercles profusely pigmented except just behind the eye; a dark spot at origin of the lateral line, scapular process dark; a dark humeral band crossing the 3d–5th scales of the lateral line; sides nearly evenly and profusely punctate; no caudal spot; anterior anal membranes sometimes black near the base; margin of caudal narrowly black.

## 2. GLANDULOCAUDA INEQUALIS Eigenmann.

Plate 59, fig. 3.

*Glandulocauda inequalis* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 169; Indiana univ. studies, 1914, 20, p. 42.

*Glandulocauda inaequalis* (sic!) MEINKEN, Wochenschr. Aquar. Terrar'kunde, 1927, 24, p. 369, fig.

HABITAT.— Southeastern Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3555 C. Type	1	40 about	Porto Alegre, Rio Grande do Sul	Haseman
3556 C. Paratypes	6	28-38	Porto Alegre, Rio Grande do Sul	Haseman

Head 4; depth 2.7-3; D. 10; A. 27-33; scales 7-38-6; eye 3 in the head, interorbital 2.5.

Compressed, preventral and predorsal areas rounded, 15-18 scales in front of the dorsal; naked area of the cheek extending somewhat between the sub-orbital and the preopercle behind; premaxillary with an outer row of 2 or 4 teeth and an inner row of 4 to 6, depending on the arrangement of the teeth toward the sides; 4 to 6 teeth in the maxillary; dentary with a large tooth at the symphysis, a smaller one next to it, followed by the largest one, this by a recurved tooth, and it by several graduated teeth; all the teeth three-pointed. Lower caudal fulera in male pungent spines.

Pores developed on six or seven scales.

Cheeks and opercle silvery, with few pigment cells; an obscure dusky humeral band, outer halves of pectoral and ventral dusky; anal margin hyaline followed by dusky which fades toward the base of the fin; upper and lower margin of caudal dark.

Otherwise this species is very similar to *G. melanogenys*.

## 3. GLANDULOCAUDA MELANOPLEURA Eigenmann.

Plate 59, fig. 1.

*Glandulocauda melanopleura* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 170; Indiana univ. studies, 1914, 20, p. 42.

HABITAT.— Rio Iguassú, southeastern Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3557 C. Type	1	51	Serrinha, Rio Iguassú	Haseman
3558 C. Paratypes	5	35-44	Serrinha, Rio Iguassú	Haseman

Head 4; depth 3.33; D. 10; A. 19–20; scales 6–36–5; eye 3 in the head; inter-orbital 2.5.

Little compressed, heavy forward. Preventral and predorsal areas rounded, the latter with about 15 scales, of which the posterior half are in a median series, the anterior paired or irregularly in a median series; skull smooth, profile rounded; frontal fontanel nearly circular, the parietal about four times as long as the frontal; occipital process very short; second suborbital covering the entire cheek except a narrow naked strip behind; snout blunt, maxillary-premaxillary border without an angle, 2.3 in the head; premaxillary with a distinct outer series of 3 teeth and an inner series of 4 teeth; maxillary with 3 teeth; dentary with 3 strongly ridged large teeth, a smaller recurved one and several minute ones on the sides; teeth of inner series of premaxillary five-pointed, those of the outer series three-pointed. The dentary teeth are unusual inasmuch as the three points are continued in ridges so distinct that the tooth has the appearance of being composed of a bundle of three teeth.

Gill-rakers 7 + 9, the upper ones very short.

Dorsal rounded, its origin about equidistant from the snout and the base of the middle caudal rays; adipose fin well developed; caudal short, the lobes a little over 4 in the length; anal short, scarcely emarginate; caudal peduncle longer than high; ventrals scarcely or not reaching anal; pectorals about to the ventrals.

Scales in regular series, occasionally a very large scale.

No anal sheath; a lobe of scales extending on the base of the rays just above the middle of the caudal, the scales apparently normal. Lateral line very short.

Dusky, a darker lateral band; no humeral or caudal spots; base of anal dark.

#### 46. *MIMAGONIATES* Regan.

*Mimagoniates* REGAN, Ann. mag. nat. hist., 1907, ser. 7, 20, p. 402.

*Cochurichthys* RIBEIRO, Kosmos, 1908, 1, no pagination.

TYPE.—*Mimagoniates barberi* Regan.

Eight or nine teeth in two series or irregularly in a single series in the premaxillary; a single series on the dentary; maxillary with a few teeth near its angle; second suborbital covering the entire cheek; lateral line incomplete; adipose fin well developed; origin of dorsal opposite origin of anal, behind the middle of the body; caudal naked, lower lobe shorter and broader than upper; two large differentiated scales, covered by other large modified scales, on the base of the caudal lobes just above the middle.

HABITAT.—Southeastern Brazil.



## 1. MIMAGONIATES MICROLEPIS (Steindachner).

Plate 67, fig. 1.

*Paragoniates microlepis* STEINDACHNER, Süßwasserf. südostl. Bras., 1876, **3**, p. 33 (Rio Macacos; creeks near Rio de Janeiro); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 441.

*Coelurichthys iporangae* MIRANDA-RIBEIRO, Kosmos, 1908, **1** (no pagination) (Iporanga); EIGENMANN, t. e., p. 428.

*Coelurichthys lateralis* NICHOLS, Proc. biol. soc. Wash., 1913, **26**, p. 151.

*Coelurichthys tenuis* NICHOLS, t. e., p. 152.

HABITAT.—Southeastern Brazil, Rio Macacos to Iporanga.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
21026	3	43 <sup>1</sup>	Rodeiro, Rio das Macacos	St. John & Ward
3547 C.	9	41–52	Muniz Freire	Haseman
3548 C.	7	23–45	Iporanga	Haseman
3549 C.	2	43, 51	Raiz da Serra	Haseman
3550 C.	50	42 <sup>2</sup>	Morretes, Paraná	Haseman
Mus. Nac. Rio de Janeiro				
Type	1	51	Iporanga	Haseman
4072 A.M.N.H.				
(type of <i>C. lateralis</i> )	1	30	Unknown	?
4087 A.M.N.H.				
(type of <i>C. tenuis</i> )	1	31	Unknown	?

Head 4.3–4.5; depth 3.5; D. 10; A. 30–34; scales 43–46; eye 3 in the head, interorbital 2.75.

Compressed, preventral and predorsal areas rounded, the latter with about 22 scales; occipital process short, bordered by three scales on each side, about nine times in the distance from its base to the dorsal; fontanels large, the frontal fontanel reaching to the line adjoining the posterior margins of the nares; interorbital convex; second suborbital covering the entire cheek, or leaving a very narrow naked band behind; mouth very oblique, the premaxillary-maxillary border nearly straight,  $2\frac{1}{2}$  in the head; premaxillary teeth 8 or 9, so arranged that it is quite evident that a double row is being formed by the alternate forward and backward movement of successive teeth, the second and fourth or third and fifth tooth being moved forward, the third and fifth or the fourth and sixth backward; about 4 teeth on the maxillary; dentary with a large tooth near the symphysis, a smaller one joining it and the largest following this, the fourth smaller and somewhat recurved, the lateral teeth minute; the largest of the dentary teeth larger than any of the upper jaw; all but the smallest teeth three-pointed.

<sup>1</sup> Largest specimen, to base of caudal.

<sup>2</sup> Largest specimen.

Dorsal angular, the last rays in the male prolonged and extending beyond the adipose fin; origin of dorsal sometimes equidistant from head and caudal, always nearer caudal than snout; caudal broad, the lower lobe the broader; anal of nearly uniform height, the last rays reaching the caudal; its origin in advance of the vertical from the origin of the dorsal; depth of caudal peduncle greater than its length; ventrals reaching anal, pectorals more or less beyond origin of ventrals; lower caudal fulera spinate.

Scales in regular longitudinal series; no anal sheath; caudal naked except for the strongly developed glandular scales; lateral line developed on eight scales or fewer.

A dusky, ill-defined humeral spot; lower part of sides with a broad dark band which is especially well demarked from the dorsal part of the sides in the young; chin dark, cheeks evenly dotted. Margin of anal dark; an oblique dark line from base of first dorsal rays to tip of last; and the middle caudal rays dark; fins all darker in males.

[Mr. J. T. Nichols has very kindly sent me the types of *C. lateralis* and *C. tenuis* for comparison. I cannot find that they differ from *M. microlepis*. The type of *C. lateralis* is a female and lacks the attenuated dorsal of the male. The type of *C. tenuis* is an emaciated male. *G. S. Myers.*]

## 2. MIMAGONIATES BARBERI Regan.

*Mimagoniates barberi* REGAN, Ann. mag. nat. hist., 1907, ser. 7, 20, p. 402 (Estación Caballero).

"Depth of body 3 to  $3\frac{2}{3}$  in the length, length of head 4 to  $4\frac{2}{5}$ . Snout much shorter than eye, the diameter of which is  $2\frac{1}{2}$  to  $2\frac{3}{4}$  in the length of the head and a little less than the interorbital width. Cleft of mouth nearly vertical; maxillary not extending to below the eye; 42 to 45 scales in a longitudinal series; lateral line on 4 to 8 scales only. Dorsal 10; origin equidistant from gill-opening and base of caudal, above the anterior part of the anal. Anal 34-38; origin equidistant from anterior part of eye and base of caudal; anterior rays the longest, about  $\frac{3}{4}$  the length of the head; free edge straight or slightly concave. Pectoral extending to or a little beyond the base of ventral. Caudal forked. A lateral band (blackish in preserved specimens) from the lower part of eye to the lower lobe of caudal. An oblique dark stripe on the dorsal; anal with a dark margin.

"Arroyo Yâcá, Estación Caballero, Paraguay.

"Several specimens, the largest 40 mm. in total length, collected by Dr. A. Barbero." After Regan.

[The relationship of *M. barberi* to *M. microlepis* is not clear. Many specimens, 47 to 53 mm., from Paranagua, Brazil, have been sent to me by Mr. Arthur Rachow of Hamburg. Some of these specimens I have sent to Mr. J. R. Norman of the British Museum, who pronounces them specifically identical with Regan's types. They have the anal 30 or 31 and the scales about 40. Otherwise they seem to differ from *M. microlepis* only in the much more distinct dark lateral stripe. I believe that they represent a distinct form, species or subspecies, but owing to lack of adequate material of *M. microlepis* I am at present unable definitely to place them.

Dr. Eigenmann had not recognized *Mimagoniates* as a member of this group, and did not include the genus or its type species in his manuscript. It is evidently generically if not specifically identical with Steindachner's form, and I have inserted the generic name as taking precedence over Miranda-Ribeiro's *Coelurichthys*, which was a year later in date. *G. S. Myers.*]

#### SUBFAMILY IGUANODECTINAE.

Slender, elongate, moderately compressed, smelt-like fishes of small size, combining in *Piabucus* the head and dentition of *Cheirodon* with the body of *Cynodon*. Mouth small, little oblique, terminal, maxillary vertical, entirely in front of eye, its posterior end above the level of the lower margin of the eye; lower jaw very weak; teeth in a series in both jaws, and with usually one tooth on each side forming an anterior series in the premaxillary; each tooth narrow at base, widely expanded above, the free surface rounded and many pointed; maxillary small, having 2 teeth; gill-membranes united, free from the isthmus; anal very long, beginning below or in front of the dorsal ray; pectoral large. Lateral line complete.

Head small, subconical; a large parietal fontanel continued as a groove on the occipital crest; a small frontal fontanel extending to above middle of eye; suborbital covering the entire cheeks, nares close together. Alimentary canal short, not equal to the length of the body.

#### *Key to the Genera.*

- a. Breast and preentral area rather broad, without a distinct keel. . . . . 47. *Iguanodectes* Cope.
- aa. Breast and preentral area trenchant, general characters of *Chalceus*, the pectoral placed lower. . . . . 48. *Piabucus* Oken.

## 47. IGUANODECTES Cope.

Iguana, native Haytian name of a lizard; ἰγκυρῆς, ὄ, a receiver. Allusion obscure.

*Iguanodectes* COPE, Proc. acad. nat. sci. Phil., 1871, p. 260.

TYPE.—*Iguanodectes tenuis* Cope.

Origin of anal under the dorsal; pectorals placed low, their base nearly horizontal; preventral area rounded, the breast between the pectorals broad, with a median ridge just perceptible.

HABITAT.—Guiana, Amazons.

## 1. IGUANODECTES TENUIS Cope.

Plate 71, figs. 3, 6; Plate 97, fig. 14.

*Iguanodectes tenuis* COPE, Proc. acad. nat. sci. Phil., 1871, p. 260, pl. 8, fig. 1 (Ambyiaeu); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, 14, p. 54; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 430; Mem. Carnegie mus., 1912, 5, p. 314.

*Iguanodectes rachovii* REGAN, Ann. mag. nat. hist., 1912, ser. 8, 9, p. 682.

HABITAT.—Amazon Basin and Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20951	2	75, 80 about	Jatuarana	Navez
20731	16	43-61	Lake Hyanuary	Agassiz
20802	1	77	Manacapuru	James
20858	2	51, 53	Jutahy	Thayer & Talisman
5213 C.	2	68, 77	Maciel, Rio Guaporé	Haseman
5214 C.	17	68-81	Bragança	Haseman
5218 C.	4	65-85	Santarém	Haseman
1885 C. } 12164 I. }	15	35-92	Rockstone	Eigenmann
1886 C. } 12165 I. }	4	68-75	Gluck Island	Eigenmann
1887 C. } 12166 I. }	10	57-73	Konawaruk	Eigenmann
1888 C. } 12167 I. }	6	53-74	Warraputa	Eigenmann
1889 C.	1	79	Tumatumari	Eigenmann
1890 C. } 12168 I. }	17	65-85	Rupununi	Eigenmann

Head 4.5; depth equals head; D. 11; A. 33-38; scales 6 to 8-54 to 64-3½ to 5; eye little longer than snout; but little less than interorbital, 3-3.3 in head (2.8 in specimens 55 mm. long). Maxillary about ⅔ length of eye, short, its one tooth bearing portion strongly convex.

Dorsal profile with no decided breaks and but gently curved; ventral outline somewhat more curved than the dorsal; preventral area rounded; fontanels elongate oval, the frontal fontanel extending to above the middle of the eye, the parietal continued as a groove to the tip of the occipital process. Nares separated by a valve only, cheeks entirely covered by the suborbitals. Mouth very short, the maxillary very short, nearly vertical, extending to the first suborbital, not nearly to eye, its posterior margin slipping slightly under the preorbital; lower jaw equal to the upper, its angle in front of the eye; the middles of the teeth in one jaw corresponding to the spaces between two teeth in the other jaw. Teeth expanded at the tip, with numerous points; teeth of the lower jaw uniserial, 6 or 7 on each side, graduated; maxillary with 1 or 2 teeth; each premaxillary with a series of 5 slightly asymmetrical teeth forming an inner row and a single much smaller tooth opposite the space between the first and second tooth forming an outer series of teeth; cheeks entirely covered; gill-membranes united to below the posterior margin of the eye, free from the isthmus;

Gill-rakers slender, pointed, about 10 on the lower arch, much shorter than the gill-filaments; last gill-arch and pharyngeal with interlocking filaments.

Dorsal pointed or rounded, entirely behind the middle of the body; but little in front of the anal<sup>1</sup>; pectorals low, scarcely to ventrals; ventrals to anal; adipose fin moderate, over the end of the anal; caudal lobes equal or the lower slightly longer. Anal long, in the adult male (78 mm.) much higher than in the female of the same size; the tips of the last rays reaching the base of the outer caudal rays; 2d to the 7th anal rays in the male each with a tubercle on each side, that of the 7th ray near its base, those of the preceding rays successively higher to the second on which it is at the top of the basal third of the anal.

Scales strictly cycloid, closely adherent, with many concentric striae, radial lines obscure or absent; lateral line complete; fins naked.

A silvery lateral band, underlaid with a black myotomic line; a large round spot on the base of the caudal, extending frequently to the end of the middle rays, excentrically placed so as to occupy the entire dorsal lobe of the caudal at times; a rounded spot at the origin of the lateral line.

Alimentary canal short, its length about equal to that of the fish without the caudal; pyloric coeca 6, long, fingerlike; air-bladder ending bluntly over the front of the anal; the air-bladder is divided into three parts, a large posterior section, preceded by a duct-like section of equal length with the posterior section and itself preceded by a slightly enlarged anterior section; the sections are of about equal

<sup>1</sup> Cope's type has been lost; he gives "Dorsal fin originating in advance of ventrals."

length, the duetus extending forward and downward from the front end of the middle section.

Vertebrae 19 + 21; brain extending beyond orbit above.

#### 48. PIABUCUS Oken.

Local name

*Les Piabuques* CUVIER, Règne animal, 1817, 2, p. 166 (*Salmo argentinus*).

*Piabucus* OKEN, Isis, 1817, p. 1183.

*Piabuca* MÜLLER & TROSCHEL, Horae ichthyol., 1845, 1, p. 9.

TYPE.—*Salmo argentinus* Linnaeus = *Trutta dentata* Koelreuter.

Long, slender, smelt-like; mouth minute; teeth multicuspid incisors in a single series except usually for a pair of teeth forming an anterior series on the premaxillaries; gill-membranes united, free from the isthmus. Preventral area compressed to an edge, but little expanded; pectorals large, placed low, their bases oblique, their margin on a line with the ventral edge when depressed. Origin of anal in front of the vertical from the dorsal.

If the same value is always to be placed on a given structure, then this genus, on account of its compressed ventral edge, forms a subfamily, distinct but closely allied to that to which *Iguanodectes* belongs.

HABITAT.—Guiana, Amazons, La Plata.

#### Key to the Species.

- a. Anal 32-35; lat. l. 54-57; depth 4.5-6; head 4.66-5; premaxillary and mandible each with 6-7 crenulated teeth. Silvery iridescent; caudal with a large, rounded, deep, black spot on its basal portion. A line along base of anal and lower margin of caudal peduncle black; snout and edge of lower lip black; caudal spot rounded, above the middle of the base. (Subgenus *Piabucidium* Myers).<sup>1</sup>.....1. *spilurus* Günther.
- aa. Anal 42-46; lat. l. 79-92. (Subgenus *Piabucus* Oken).
  - b. Anal 42-46; lat. l. 79-89; depth 4.4; head from a little less than 5-5.5 in the length. Premaxillary with 6 teeth, mandible with usually 8 teeth. A silvery gray lateral band from the eye and terminating in an obscure dark spot on the base of the middle caudal rays. Lower lip black.
    - 2. *dentatus* Koelreuter.
  - bb. Anal 44-46; lat. l. 82-92; depth 4; head 5.5-6; premaxillary with 6 or 7 teeth, maxillary with 2, dentary with 9; a silvery lateral band ending in a black band on the middle caudal rays; lower jaw and maxillaries conspicuously black. ....3. *melanostoma* Holmberg.

#### 1. PIABUCUS SPILURUS Günther.

*Piabuca spilurus* GÜNTHER, Cat. fishes Brit. mus., 1861, 5, p. 314 (Cupai River); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, 14, p. 57; STEINDACHNER, Ichthyol. beitr., 1891, 16, p. 23 (Hya-vary); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 440.

HABITAT.—Amazons.

This species reaches a length of 2½ inches. It is known only from a few specimens in the British and Vienna Museums.

<sup>1</sup> *Piabucidium* Myers, new subgenus, type *Piabucus spilurus* Günther.

Head 4.66–50; depth 4.5–6; D. 10; A. 32–35; scales 7.5–56 to 57–4.

Premaxillary and mandible each with 6 or 7 crenulate teeth; a tooth in front of the main series in each premaxillary.

Origin of dorsal midway between base of caudal and occiput or eye, in front of that of anal.

A silvery lateral band; a large round spot on base of caudal above its middle.

## 2. PIABUCUS DENTATUS (Koelreuter).

Plate 71, figs. 2, 4; Plate 97, fig. 15.

*Piabuca* MARCGRAVIUS, Hist. rev. nat. Bras., 1648, **4**, p. 170.

*Trutta dentata* KOELREUTER, Nov. comm. Petropoli, 1761, **8**, p. 113, tab. 11, fig. 4.

*Piabucus dentatus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 410; Mem. Carnegie mus., 1912, **5**, p. 316; STARKS, Leland Stanford Jr. univ. publ., Univ. ser., 1913, Fishes of the Stanford exped. to Brazil, p. 17 (Pará).

*Salmo argentinus* LINN., Syst. nat., 1766, **12**, p. 511; BLOCH, Ausländische fische, 1785, **8**, p. 107, taf. 382, fig. 1; BLOCH, Systema ichthyologiae, Ed. Schneider, 1801, p. 403.

*Characinus argentinus* LACEPÈDE, Hist. nat. poissons, 1790, **6**, p. 272.

*Piabuca argentina* CUV., Règne animal, 1817, **2**, p. 310 (fide Müller & Troschel); MÜLLER & TROSCHER, Horae ichthyol., 1845, **1**, p. 9, taf. 1, fig. 1; Fische British Guiana, 1848, **3**, p. 633 (Lake Amucu and Savanna swamps); CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, **22**, p. 108; GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 344; EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 57; STEINDACHNER, Ichthyol. beitr., 1891, **15**, p. 22 (Iquitos).

HABITAT.—Guianas and Amazon.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1891 C. } 12169 I. }	8	102–138	Koreabo Rubber Plantation	Shideler
1892 C. } 12170 I. }	2	149, 155	Wismar	Eigenmann
5224 C.	9	140–175	Pará	Haseman

Head 5.66–6.3; depth 3.6 in Guiana specimens, 4.33–4.5 in Pará specimens; D. 10 or 11; A. 42–45; lat. l. 84 in Guiana specimens, 88–94 in Pará specimens; head, 1.5 in interorbital.

Elongate, compressed; profile depressed over the nape and eyes; ventral profile exaggerated in front of the ventrals; predorsal area narrowly rounded, preventral area compressed to an edge, the region between the bases of the pectorals stiff, the region just in front of the ventrals with a flexible ridge of scales.

Occipital crest narrow, reaching about one seventh of the distance from its base to the dorsal; parietal fontanel broad, more than twice as long as the frontal, which is nearly equilaterally triangular; mouth small, terminal, the jaws subequal,

premaxillary meeting the minute maxillary at an angle. Six or 7 pluricuspid teeth in the inner row of the premaxillary, the outer row composed of a single tooth on each side of each jaw, similar to, but narrower than, those of the inner series; 2 similar teeth on the maxillary and 7 similar ones on each side of the lower jaws; cheeks narrow, entirely covered by the suborbitals.

Scales thin, cycloid, deeply imbricate, with few (or more frequently no) radial striae; caudal and anal naked; lateral line complete, decurrent; dorsal short, its length less than half its height, which is 6.75 in the length; lower caudal lobe the longer, 4.5 in the length; origin of anal under origin of dorsal or a little farther forward; ventrals small, not reaching anal, in contact along their inner margin, when closed; pectorals large, directed downward and backward when closed, the tips frequently projecting beyond the ventral profile, not reaching or just reaching the ventrals.

Iridescent, the middle caudal rays dusky or black, otherwise without dark marking.

### 3. *PIABUCUS MELANOSTOMA* Holmberg.

Plate 71, figs, 1, 5.

*Piabuca melanostoma* HOLMBERG, Revista Arg. nat. hist., 1891, **1**, p. 192 (Formosa, Chaco; Asuncion); EIGENMANN & OGLE, Proc. U. S. nat. mus., 1907, **33**, p. 31 (Paraguay).

HABITAT.—Paraguay Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5226 C.	1	53	Caceres	Haseman
5225 C.	16	66-115 about	Rio Jauru	Haseman

Premaxillary with a single series of teeth only. Nevertheless this species is closely allied to *Piabucus dentatus*, being the southern representative of the genus.

Head 5.5-6; depth 4; D. 11; A. 44-46; scales 11-82 to 87-7; eye in the largest equal to the snout, 1.4 in interorbital, a little more than 3 in head.

Compressed; elongate; preventral region trenchant, the ridge immediately in front of the ventrals thin, flexible; profile from chin to ventrals arched; dorsal profile depressed over the eyes; predorsal area rounded, without a regular median series of scales; interorbital convex; frontal fontanel triangular, short, 2 in the parietal; suborbitals covering the entire cheek; snout short, blunt; the lower jaw included, very short, its articulation in front of the eye; maxillary with the margin of its non-tooth-bearing portion very convex; teeth all finely denticulate,



in a single series; 9 teeth on the mandible; 2 on the maxillary and 6 or 7 on the premaxillary.

Gill-membranes united, free from the isthmus; gill-rakers short, 6+12.

Lateral line complete, but little decurved; some rows above the lateral line below the end of the dorsal merged; rows of scales deflected toward the anal; caudal and anal naked, axillary scales small.

Origin of dorsal nearer caudal than head; adipose fin small; origin of anal in front of the dorsal; ventrals not reaching anal, pectorals not reaching ventrals.

Chin and lower lips black; maxillary dark; middle caudal rays black, the black in formalin specimens extending forward along the sides to above the ventrals.

The relationship of this species with *Piabucus dentatus* is undoubted. Technically on account of the absence of an outer row of premaxillary teeth, it should be placed with the *Chcirodontinae*.

#### SUBFAMILY STETHAPRIONINAE.

Allied to the Tetragonopterinae from which the subfamily technically differs in the possession of a procumbent predorsal spine.

Excessively compressed, very deep; dorsal and ventral outlines similar; premaxillary teeth in two series, mandibulary and if present the maxillary teeth in a single series, similar to those in Tetragonopterus and Moenkhausia with which the subfamily is most closely related. Caudal scaled; lateral line complete; ventral surface compressed to an edge; adipose fin present, dorsal more or less falcate, anal long, pectorals short.

It is quite probable that the predorsal spines in Stethaprion, Ephippicharax and Brachyhalcinus are of convergent origin and do not indicate a common descent for the subfamily.

#### Key to the Genera.

- a.* Predorsal spine long, slender, spear-shaped, fitting into a groove in the back; origin of anal under dorsal; scales rather small, over 60 in the lateral line, caudal scaled; anal scaled for half or less of its height; scales rough.....49. *Stethaprion* Cope.
- aa.* Predorsal spine simple or scale-like, spoon- or saddle-shaped, concave below, fitting into a notch in the back. Caudal scaled, scales less than 40.....50. *Ephippicharax* Fowler.
- aaa.* Predorsal spine trigger- or hammer-shaped, its free portion forming a longer anterior and shorter posterior branch, both of which are sharply pointed; caudal scaled; scales large, about 40. 51. *Brachyhalcinus* Boulenger.
- aaaa.* Predorsal spine saddle-shaped, entirely concealed under the skin without projecting spine; dorsal and anal falcate.....52. *Poptella* Eigenmann.

## 49. STETHIAPRION Cope.

σθηθός, τό, breast, πρίων, ὁ, a saw. Serrated breast.

*Stethaprion* COPE, Proc. Amer. philos. soc., 1870, p. 562 (*erythrops*).

TYPE.—*Stethaprion erythrops* Cope.

Cope says of this genus: "It has the physiognomy of *Myletes*, but is essentially near to *Tetragonopterus*."

Predorsal spine long, slender, spear-shaped, fitting into a groove in front of the dorsal; scales small (61–67); ventral edge with an incipient serrature.

HABITAT.—Amazons from the Madeira to Peru and Ecuador, in the Madeira to Bolivia.

*Key to the Species*

- a. Scales along the ventral edge with a narrow margin bent over the other side.
  - b. D. 12; A. 38–65; scales 19 to 24–61 to 64–16 to 21; depth 1.4–1.66. . . . . 1. *erythrops* Cope.
  - bb. D. 12; A. 37; scales 19–67–16; depth 1.66; head 3–4. . . . . 2. *chryseum* Cope.
- aa. Two series of narrow pointed scales along each side of the ventral edge and some narrow median scales; free edges of scales crenate. . . . . 3. *crenatum* Eigenmann.

The following are common characters of *S. erythrops* and *S. chryseum*.

Short, deep, much compressed fishes reaching a length of 103 mm. They are Ctenobrycon with a predorsal spine and compressed ventral edge.

Dorsal profile much arched, highest at the origin of the dorsal where it forms an angle of about 120 degrees; ventral profile more greatly arched, its lowest point at the origin of the anal; profile depressed over the eye; occipital crest tetragonopteriform; fontanels large, the frontal fontanel pear-shaped, its narrow anterior end reaching beyond the pupil, parietal fontanel considerably longer but narrower than the frontal, continued to near the tip of the occipital as a groove; bridge between fontanels flush with the surface of the skull. Head broad above, compressed below.

Mouth large; angle of lower jaw behind front of the eye; maxillary reaching beyond front of eye, not slipping under preorbital, its posterior angle slipping over the first suborbital; cheeks with a narrow naked area around the entire free edge of the second suborbital; teeth as in *Tetragonopterus* and *Astyanax*; maxillary with 2 small teeth; premaxillary with an outer series of 4 narrow teeth and an inner series of 5 slightly graduated 5-pointed incisors; lower ramus followed on the side with a series of minute conical teeth.

Gill-membranes free from each other and from the isthmus; gill-rakers slender 11 + 14; a narrow naked area between the second suborbital and the preopercle.

A spear-shaped procumbent, erectile predorsal spine, as long as the eye and with a pair of lateral retrorse hooks at its middle; dorsal over the minute ven-

trals, its origin a little nearer snout than caudal; adipose fin narrow, preceded by a low ridge, slightly in front of end of anal; caudal large; anal emarginate in front, its basis very oblique, at an angle of about 45 degrees; rayed part of the anal preceded by four or five crowded, graduated spine-like rays, of which the first has an antrorse as well as retrorse point. Ventrals very small, reaching origin of anal. Pectorals small, reaching to above middle of ventrals.

Scales with several concentric free edges, no radials; lateral line complete, nearly straight along the first few pores, moderately decurved beyond them; anal with closely applied small scales for half its height; caudal scaled to near its tip; scales regularly imbricate, the rows deflected toward the anal over the anal muscles.

Air-bladder large, the posterior somewhat longer than the anterior. Alimentary canal short, about  $1\frac{2}{3}$  times the entire length of body; stomach of one containing a fish.

Vertebrae 12 + 20; coracoids less expanded than in *Stichonodon*; not adpressed behind; its vertical posterior margin in front of the posterior edge of the base of the pectoral.

# 1. STETHAPRION ERYTHROPS Cope.

Plate 70, fig. 1; Plate 98, fig. 6.

*Stethaprion erythrops* COPE, Proc. Amer. philos. soc., 1870, p. 562, fig. C. (Pebas); STEINDACHNER, Flüssf. Südamer., 1882, 4, p. 40 (Jutahy; Madeira; Santarém; Iquitós); Ichthyol. beitr., 1882, 12, p. 20 (Santarém; Rio Madeira; Jutahy); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, 14, p. 60; FOWLER, Proc. acad. nat. sci. Phila., 1906, p. 481, fig. 59 (Pebas); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 411.

HABITAT.—Amazons.

## *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
19268	8	85-103	Jutahy	James, Thayer & Talisman
19107	23	67-79	Jutahy	James, Thayer & Talisman
20792	2	65 about <sup>1</sup>	Hyavary	Bourget
20727	3	68-75 about	Coary	Agassiz
15830 I.	31	63-100	Yarinacocha	Allen
15877 I.	4	70-92	Rio Itaya, near Iquitós	Allen
15886 I.	1	66	Amazon at Iquitós	Allen

<sup>1</sup> Largest specimen.

Head 4, measured in the line from snout to middle of caudal; depth 1.4–1.66; D. 12; A.  $\frac{38}{1}$ ,  $\frac{39}{3}$ ,  $\frac{40}{3}$ ,  $\frac{41}{7}$ ,  $\frac{42}{11}$ ,  $\frac{43}{4}$ ,  $\frac{44}{1}$ ,  $\frac{45}{6}$ , scales 19 or 20–61 to 64–16 to 21. Eye

in the larger a little more than 2 in the distance from the snout to the upper angle of the gill-opening, not quite equal to interorbital.

Highly iridescent, no markings.

## 2. STETHAPRION CHRYSSEUM Cope.

*Stethaprion chryseum* COPE, Proc. acad. nat. sci. Phila., 1871, p. 261 (Ambyiaçu); Proc. Amer. philos. soc., 1878, **17**, p. 692 (Peruvian Amazon); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 60; FOWLER, Proc. acad. nat. sci. Phila., 1906, p. 482, fig. 60 (Ambyiaçu); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 441.

HABITAT.—Marañón.

This species is probably identical with *S. erythrops*. The characters which are said to distinguish it are given in the key. It is known from a specimen 71 mm. long (with a damaged caudal).

## 3. STETHAPRION CRENATUM Eigenmann.

*Stethaprion crenatus* EIGENMANN, Ann. Carnegie mus., 1916, **10**, p. 80, pl. 16.

HABITAT.—Madeira Basin.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5228 C. Type	1	95	San Joaquin, Bolivia	Haseman
5228 bis C. Paratypes	2	53–85	San Joaquin, Bolivia	Haseman
5756 C. Paratype	1	96	Cachoele de Riberão de Rio Madeira	Haseman

Head 4; depth 1.5 in largest to 1.75 in smallest; D. 12; A. 3 + 42 or 43; scales 21 to 23–66 or 67–16 or 17; eye 3 in head, interorbital 2–2 $\frac{1}{3}$ .

Much compressed; dorsal profile steep to the dorsal, depressed over the eyes; ventral profile a nearly perfect segment of a circle from the gill-opening to the end of the anal; predorsal line scaled, but without a regular median series of scales; about five series of narrow scales ending in spines along the ventral edge, the scales on either side of these not quite symmetric; occipital process extending one third of distance to the dorsal; frontal fontanel oval, considerably shorter than the parietal, its anterior margin over front of pupil; a naked area about a fourth as wide as the third suborbital at its widest point extending around its entire free margin; maxillary-premaxillary border longer than eye; premaxillary with 4 teeth in the outer series, 5 5-pointed teeth in the inner series; mandible with 4

5-pointed teeth and about 8 abruptly smaller, mostly conical teeth on the sides; maxillary with 1 or 2 teeth.

Gill-rakers about 11 + 16.

Origin of dorsal little nearer tip of snout than base of caudal, its highest ray  $3\frac{2}{5}$ –4 in the length; adipose scaled on its basal half, preceded by a short dermal ridge; caudal lobes about as long as the head; origin of anal equidistant with origin of dorsal from the end of the lateral line; margin of anal slightly rounded, without a lobe; ventrals about equal to the postorbital part of the head, their origin equidistant from tip of snout with the origin of the dorsal; pectorals about as long as head, reaching beyond the line joining origins of dorsal and ventral.

Scales covering all but a narrow fringe of the caudal and anal; concentric free edges of the scales crenati; the scales symmetrically arranged except over anal musculature.

No distinct color markings.

#### 50. EPHIPPICHARAX Fowler.

ἑφιππος, riding; *Charax*, a genus of characins. In allusion to the predorsal spine.

*Fowlerina* EIGENMANN, Ann. Carnegie mus., 1907, **4**, p. 153; Amer. nat., 1907, **41**, p. 772 (preoccupied). *Ephippicharax* FOWLER, Science, 1913, **38**, p. 51.

TYPE.—*Tetragonopterus compressus* Günther.

Predorsal spine a simple spine, or scale-like, concave below, and fitting into a notch in the back in front of the dorsal fin; no preanal spine; caudal scaled; anal with one row of scales; anal long; scales 34–36; preventral region with a median, non-spinous series of scales.

HABITAT.—Guianas, Amazon; Paraguay; Rio San Francisco.

#### Key to the Species.

- a. Predorsal spine blunt, with a retrorse hook on each side near the end in the younger.
  - b. Anal usually with 32 rays.....1. *orbicularis* Cuvier & Valenciennes.
  - bb. Anal usually with 36 rays.....2. *paraguayensis* Eigenmann.
- aa. Predorsal spine a simple pungent spine.....3. *franciscoensis* Eigenmann.

#### 1. EPHIPPICHARAX ORBICULARIS (Cuvier and Valenciennes).

Plate 70, fig. 2; Plate 98, fig. 5.

*Tetragonopterus orbicularis* CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, **22**, p. 138 (Essequibo; Amazon); CASTELNAU, Exped. Amerique Sud. Poissons, 1855, p. 65, pl. 32, fig. 3 (Amazon); KNER, Characinen, 1859, p. 38 (Villa Maria); STEINDACHNER, Süßwf. Südöst. Bras., 1876, **3**, p. 7 (Rio Parahyba?; Amazon; Villa Maria); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 276; VAILLANT, Bull. mus. hist. nat., 1899, **5**, p. 155 (Carnot).

*Fowlerina orbicularis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 441; Mem. Carnegie mus., 1912, **5**, p. 374, pl. 46, fig. 2.

*Ephippicharax orbicularis* FOWLER, Proc. acad. nat. sci. Phila., 1914, p. 250 (Rupununi); PEARSON, Indiana univ. studies, 1925, **64**, p. 48.

*Gymnocorymbus nemopterus* FOWLER, Proc. acad. nat. sci. Phila., 1914, p. 248, fig. 8 (Rupununi).

HABITAT.—Guianas, Amazons, Paranahyba, southeastern Brazil.

It seems very doubtful whether the specimens recorded by Steindachner from the Parahyba belong to this species. They may be *E. franciscoensis*. I have examined the type of *Gymnocorymbus nemopterus* and found it to belong to the present species.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20706 M. C. Z.	1	52	Teflé	Agassiz
1946 C. }	19	41-81	Crab Falls	Eigenmann
12207 I. }				
1947 C. }	3	44-50	Lama Stop-off	Eigenmann
12208 I. }				
1948 C. }	1	50	Amatuk	Eigenmann
1949 C. }	2	58, 87	Below Potaro Landing	Eigenmann
12209 I. }				
1950 C. }	72	71 <sup>1</sup>	Konawaruk	Eigenmann
2454 C. }				
12210 I. }	18	96-115	Kangaruma	Eigenmann
1951 C. }				
12211 I. }	24	40-83	Rockstone	Eigenmann
1952 C. }				
12212 I. }	98	75 <sup>2</sup>	Tumatumari	Eigenmann
1953 C. }				
12213 I. }	164	70 <sup>2</sup>	Wismar	Eigenmann
1954 C. }				
12214 I. }	7	42-52	Warraputa	Eigenmann
1955 C. }				
12215 I. }	5	55-71	Below Wismar?	Eigenmann
1956 C. }				
12116 I. }	8	45-62	Erukin	Eigenmann
2206 C. }				
12362 I. }	1		Santarém	Haseman
5236 C.	1	60 about	Manaos	Haseman
5235 C.	1	55 about	Maciél	Haseman
5234 C.	1		Bastos	Haseman
5233 C.	2	50, 67	San Joaquin, Bolivia	Haseman
5232 C.	4	50-57	Lagoa de Parnagua	Haseman
5237 C.				

<sup>1</sup> Largest specimen; most of the specimens measure about 50 mm.

<sup>2</sup> Largest specimen

Head about 4; depth nearly 2 in the young, 1.4 in some of the largest; D. 11 or 12; A. 30-34, most frequently 32 in Guiana; scales 8-34 to 36-6 to 8; eye .7 in the snout, 2.4-2.6 in the head, 1+ in the interorbital.

Extremely deep and compressed, preventral surface bluntly keeled; in part covered by median scales, in part by scales bent over the ridge; predorsal area keeled, with a median series of about eight scales; ventral arch more pronounced than the dorsal; anal base straight; predorsal profile arched, with a distinct depression over the eyes; occipital process, as in all deep species, very long and narrow, reaching one third of the way to the dorsal, bordered by five scales on each side; predorsal spine in old individuals more or less leaf-shaped, with entire margins, in the young hastate, with retrorse barb on each side; fontanel narrow, the parietal continued as a deep groove on the occipital process.

Second suborbital leaving but a very narrow naked margin in the adult; jaws equal, the premaxillary with a short horizontal extent, meeting the maxillary at an angle; dentition as in *Tetragonopterus*, premaxillary with an inner series of about 5 teeth, whose denticles are in a crescent, and an outer series of 4 or more teeth, the second or third withdrawn from the line of the rest; dentary with 4 large teeth, abruptly followed by minute teeth on the side; maxillary slender, with as many as 3 teeth on its upper angle, these scarcely evident in small specimens.

Gill-rakers long, slender, 10 + 16.

Scales regularly imbricate, except over the anal musculature, each scale with a few radiating striae; lateral line but slightly decurved; anal with a sheath of two rows of scales, which are continuous with those of the sides; caudal lobes with minute scales for more than half their length.

Dorsal pointed, the highest ray in the young reaching the adipose, shorter in the adult; adipose large; caudal forked, anal emarginate, more so in young than in adult; ventrals reaching to, or a little beyond, the origin of the anal, pectorals to above the middle of the ventrals.

Highly iridescent, silvery; a silvery lateral band; two obscure vertical humeral bars, the second merging into the pigmentation of the sides; outer margin of ventrals and anterior margin of anal frequently black; fins variously peppered.

The specimens from Erukin differ from the others as follows:—the dorsal and anal are falcate, the longest dorsal rays reaching beyond the origin of the adipose, the longest anal ray to the base of the twenty-fifth ray.

2. *EPHIPPICHARAX ORBICULARIS PARAGUAYENSIS* (Eigenmann).

*Tetragonopterus orbicularis* GÜNTHER, Ann. mag. nat. hist., 1880, ser. 5, 6, p. 12 (La Plata).

*Brachyhalcinus retrospina* BOULENGER (in part), Ann. mag. nat. hist., 1892, ser. 6, 10, p. 12 (Santa Cruz).

*Fowlerina paraguayensis* EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 153; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 441.

HABITAT.—Paraguay Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
99931 I.	1		Arroyo Trementina	Anisits
5229 I.	18	30-67	Caceres	Haseman
5230 I.	9	33-68	Jauru	Haseman
5231 I.	1	52	Santa Rita	Haseman

There are in the British Museum two from Santa Cruz, three from San Luis, five from Descalvados.

This variety differs from the Amazonian and Guiana species in having the anal usually 36. In a number examined including those in the British Museum,

the anal rays are  $\frac{34}{3}$ ,  $\frac{35}{6}$ ,  $\frac{36}{14}$ ,  $\frac{37}{7}$ ,  $\frac{38}{1}$ .

The specimen from Santa Rita has a submedian dark band through the entire anal.

3. *EPHIPPICHARAX FRANCISCOENSIS*, sp. nov.

Plate 70, fig. 3, 5.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
M. C. Z. Paratypes	20 ♂ 3 ♀	60-80	San Francisco below the falls	Hartt
5240 C. Type		72	Barreiras, Lagoa of Rio Grande	Haseman
5561 C. Paratypes		46-72	Barreiras	Haseman
5566 C. Paratypes	18	46-73	Lagoa de Porto	Haseman
5565 C. Paratypes	4		Jaozeiro	Haseman
5567 C. Paratypes	27	51-79	Piropora	Haseman
5564 C. Paratypes	2	61-63	Cidade do Barra	Haseman
5562 C. Paratypes	2	about 23	Cidade do Barra, Rio Grande	Haseman
5563 C. Paratypes	7	45-57	Lagoa de Pereira	Haseman
5568 C. Paratypes	7	31-63	Boqueiras near mouth of Rio Preto	Haseman
5569 C. Paratypes	40	32-67	Penedo	Haseman
5570 C. Paratypes	23	largest 75	Santa Rita	Haseman



This species first collected by Hartt in 1867 was found in the San Francisco from its mouth to Piropora. It is, so far as known, confined to the San Francisco Basin.

In the Paranahyba, just north of the San Francisco Basin, *E. orbicularis* is found. Most readily distinguished by its simple spine-like predorsal spine.

Head 3.75; depth about 1.71-2; D. 10 or 11; A. 34-38; scales 8-33 to 37-8; eye 2.75 in head, a little greater than interorbital.

Compressed; the more elongate oval, the deeper ones subrhomboidal, the deepest point at the origin of the anal; preanal region very narrowly rounded; predorsal area in part with a naked median line, in part with the scales of one side or the other bent over the ridge; occipital process about 3 in the distance from its base to the first dorsal ray, bordered by about 5 scales along each side; nape depressed, interorbital broad, convex; frontal fontanel equal to the parietal; second suborbital leaving a wider naked border below than behind; maxillary-premaxillary border 2-2.5 in the head; usually 4 teeth in the outer row of the premaxillary, 5 in the inner; maxillary with 2 teeth; mandible with 4 large teeth, the second out of line, and 5 to 7 minute teeth anteriorly on the sides, the greater part of the sides of the lower jaw being without teeth.

Predorsal spine narrow, pungent, without lateral hooks, about three fourths as long as the eye; dorsal variously falcate, the third ray highest, in extreme cases reaching the caudal, sometimes only two thirds to tip of adipose; origin of dorsal a little nearer snout than caudal; origin of anal about under middle of dorsal, for the most part low, its anterior lobe composed of but few rays, the second of the developed rays highest, sometimes reaching middle of caudal; ventrals small, just reaching anal; pectorals small reaching to above middle of ventrals.

Scales everywhere regularly arranged except over anal muscles, where the rows are but slightly deflected; a sheath of two rows of scales on the anterior part of the anal, none on the last, the scales in the middle of the fin attached to the membranes, in front not attached; caudal lobes scaled, the scales extending a little further on the lower lobe.

Prolonged rays of dorsal and anal, black. Two faint humeral bars in the darker specimens.

#### 51. BRACHYCHALCINUS Boulenger.

*βραχύς*, short; *chalcinus*, a genus of characins, from *χαλκίος*, brazen. Short chalcinus.

*Brachychalcinus* BOULENGER, Ann. mag. nat. hist., 1892, ser. 6, **10**, p. 11, pl. 2, fig. 2.

TYPE.—*Brachychalcinus retrospina* Boulenger.

Deep, compressed, with an incipient ventral serrature. Predorsal spine trigger- or hammer-shaped, its free portion forming a longer anterior and a shorter posterior branch, both of which are sharply pointed; two preanal spines, the first similar to the predorsal spine; caudal sealed; anal naked except at its base; dentition of *Tetragonopterus*.

Boulenger described two generic types under his *Brachyhalcinus*. The name is here restricted to the one figured.

HABITAT.—Tabatinga and Paraguay.

#### *Key to the Species.*

- a. D. I, 12; A. II, 35; scales 11–32 to 33–10 or 11, depth  $1\frac{1}{2}$ ; head more than  $3\frac{1}{2}$ ; two faint, large oblique, oval, dark spots in the humeral region, a silvery lateral band. 1. *copei* (Steindachner).
- aa. D. I, 11 or 12; A. II, 32–34; scales 10–36–10; depth 1.4–1.6; head 3.75–4.33; a silvery lateral stripe; fins speckled with black, adipose black-edged; no median series of scales before the ventrals. Belly with small scales on one side or the other, with the margin bent over. Maxillary with 1 tooth; gill-rakers 20+21, the 9 above the middle much smaller. . . . . 2. *retrospina* Boulenger.

#### 1. BRACHYCHALCINUS COPEI (Steindachner).

*Stethaprion copei* STEINDACHNER, Flössf. Südamer., 1882, **4**, p. 40 (Tabatinga); EIGENMANN & EIGENMANN, Proc. U. S. nat. mus., 1891, **14**, p. 60; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 44.

*Brachyhalcinus copei* PEARSON, Indiana univ. studies, 1925, **64**, p. 46 (Ixiamas).

HABITAT.—Tabatinga, and the Beni.

I have not seen this species, which is known only from the types, three specimens, the largest 58 mm.

“Head 3.5; depth 1.5; D. I, 12; A. II, 35; scales 11–32 or 33–10 or 11; eye 2.25–2.33 in the head; interorbitals 2.75–2.4. Second suborbital covering the entire cheek. Origin of dorsal in middle of body.” — *Steindachner*.

[Since the above account was written Mr. Pearson collected eight specimens (17261 I.) at Ixiamas, Beni Basin. No specimens of *B. retrospina* being at hand, it has been impossible to say whether or not the species are the same.—*G. S. Myers*.]

#### 2. BRACHYCHALCINUS RETROSPINA Boulenger.

Plate 70, fig. 4.

*Brachyhalcinus retrospina* BOULENGER (in part), Ann. mag. nat. hist. 1872, ser 6, **10**, p. 12, pl. 2, fig. 2 (Santa Cruz); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 441.

HABITAT.—Paraguay Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5571 C.	1	37 about	Rio Jauru	Haseman
5572 C.	1	30 about	Caceres	Haseman

I have also examined the types in the British Museum. Of the specimens mentioned by Boulenger, the one figured is the only one belonging to this species. It measures 80 mm. This species is probably identical with *B. copei*.

Head 3.75–4.33; depth 1.4–1.6; D. I, 11 or 12; A. II, 32–34; scales 10–36–10 to ventrals; eye in the small specimens enumerated 2 in head to upper angle of gill-opening, a little larger than interorbital.

Very much compressed, deep, subrhomboidal; preventral area trenchant without a median series of scales, the scales of one side or the other bent over the middle line; predorsal line partly naked, partly covered by the bent-over edges of scales of one side or the other; occipital process 2.5 in the distance from its base to the dorsal; fontanels very large, the length of the frontal fontanel about 1.33 in the parietal without its groove; a wide naked area about the margin of the second suborbital; maxillary-premaxillary length 2 in the head; maxillary with 2 small teeth; premaxillary with an outer series of 4 teeth and an inner series of 5; mandible with 4 graduated teeth, abruptly with minute ones on the sides.

Gill-rakers about 6+11.

First dorsal ray equidistant from snout and caudal, the highest ray not reaching the large adipose; origin of anal nearly equidistant with the first dorsal ray from the end of the lateral line; ventrals small, just reaching the first anal spine; pectorals slender, reaching to above ventrals; predorsal spine triangular from the side, attached at the lower angle of the triangle, the anterior spine the longer or not; first anal spine like that of the dorsal, the second a simple spine not much longer than the posterior horn of the first spine.

Scales smooth, entire, with very few radials, regularly imbricate except over the muscles of the anal fin; lateral line nearly straight; caudal scaled at the base only, in the small specimens at least; anal with a single row of scales in front only.

Two faint humeral bands, the first crossing the second and third scales of the lateral line.

## 52. POPTELLA Eigenmann.

For Dr. C. M. L. Popta.

*Poptella* EIGENMANN, Bull. mus. comp. zool., 1908, 52, p. 106.

TYPE.—*Tetragonopterus longipinnis* Popta.

Predorsal spine saddle-shaped, entirely concealed under the skin, without projecting spine; dorsal and anal falcate.

HABITAT.—Dutch Guiana.

1. *POPTELLA LONGIPINNIS* (Popta).

Plate 61, fig. 1.

*Tetragonopterus longipinnis* POPTA, Notes Leyden mus., 1901, **23**, p. 85 (Dutch Guiana); STEINDACHNER, Anz. K. akad. wiss. Wien, 1907, p. 293; POPTA, Zool. anz., 1908, **32**, p. 763.

*Poptella longipinnis* EIGENMANN, loc. cit., Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 441.

COTYPE.— I. U. 50 mm. Dutch Guiana.

Dr. Popta of the Leyden Museum has allowed me to add one of the cotypes of this species to the collection of Indiana University.

Head 3.5; depth 1.7–1.9; D. 12; A. 36 (34–38); scales 9–37–9 to ventrals; eye 2.4–2.75, equal to interorbital.

Deep, compressed; preventral area very narrowly rounded, with a nearly complete, regularly bent median series of scales; predorsal area narrowly compressed; the median line naked.

Occipital process narrow, turned sharply up from the concave anterior profile, its length more than  $\frac{1}{3}$  in the distance from its base to the dorsal, bordered on the sides by 5 scales; interorbital broad, convex; fontanels broad, the frontal fontanel longer than the parietal exclusive of the occipital groove, less than twice as long as broad, extending beyond the anterior margin of the pupil. Second sub-orbital leaving a naked space  $\frac{1}{4}$  the width of the bone around its margin; maxillary a little more than  $\frac{1}{3}$  of the length of the head; maxillary and snout equal to the eye; 5 teeth in the outer series of the premaxillary, the third withdrawn somewhat; 5 teeth in the inner series of the premaxillary; maxillary with 2 small teeth; dentary with 4 large teeth in front and abruptly minute ones on the sides.

Gill-rakers 12 + 17, the longest about  $\frac{1}{3}$  of the eye.

Scales cycloid, with very few and inconspicuous striae, regularly imbricate except over the anal where the rows are deflected toward the fin by the interpolation of series of scales; anal sheath low, of three rows of scales, not more than  $\frac{1}{3}$  the height of the highest ray; caudal lobes scaled for almost half their length; lateral line but little curved, the row of scales below it parallel with it, without interpolated scales.

Origin of dorsal equidistant from snout and adipose, a saddle-shaped predorsal plate; anal emarginate, its origin under end of dorsal; origin of ventrals and fourth (first according to Popta) dorsal ray equidistant from snout, ventrals reaching beyond origin of anal; pectorals to near the middle of the ventrals.

A vertical humeral spot crossing the 3d and 4th scales of the lateral line; another cross shade under the dorsal; no caudal spot; a dusky lateral streak; outer ventral rays and tips of the first five anal rays black; dorsal dusky.

## SUBFAMILY STICHONODONTINAE.

This subfamily differs from *Moenkhausia* of the Tetragonopterinae only in the ventral area, which is trenchant.

Teeth all notched; premaxillary teeth in two series, mandible with a single series of teeth, the second one of which is somewhat in advance of the others; gill-rakers free from the isthmus and from each other; dorsal near the middle; without a procumbent spine.

## 53. STICHONODON Eigenmann.

στῖχος, ó, a row; ὀδων, ó, tooth

*Lutkenia* STEINDACHNER, Ichthyol. beitr., 1876, **5**, p. 38 (*insignis*) preoccupied.

*Stichonodon* EIGENMANN, Smith. misc. coll. quart., 1903, **45**, p. 146 (*insignis*).

TYPE.—*Lutkenia insignis* Steindachner.

Caudal and anal scaled; adipose fin present; lateral line complete. For the rest consult the description of the single species.

HABITAT.—Amazon.

## 1. STICHONODON INSIGNIS (Steindachner).

*Lutkenia insignis* STEINDACHNER, Ichthyol. beitr., 1876, **5**, p. 38, pl. 8, fig. 1 (Tabatinga; Santarém).

*Stichonodon insignis* EIGENMANN, Smith. misc. coll. quart., 1903, **45**, p. 146; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 441.

HABITAT.—Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
19276 M. C. Z.	4	39-50	Lake Saracá	Thayer
20803 M. C. Z.	2	41, 55	Manacapurú	James
20987 M. C. Z.	6	32-50	Serpa	Thayer

The specimens are all rather poor.

Short, deep, much compressed fishes reaching a length of 82 mm.

Head 4; depth 1.66-1.75; D. 12; A. 34-38; scales 6 or 7-34 to 36-7 or 8; eye 2.5 in the head, equal to interorbital.

Dorsal outline less arched than the ventral; lowest point of the ventral profile in front of the ventral; profile depressed over eye; entire ventral surface knife-like, a regular median series of scales in front of the ventrals, bent over the middle, a median predorsal series of 10 scales; occipital crest narrow, long and very high, as in *Tetragonopterus*, bordered by four or five scales, 2.5 in the distance from its base to the dorsal; fontanels large, the frontal but little shorter and somewhat

## THE AMERICAN CHARACIDAE.

narrower than the parietal, extending considerably beyond the middle of the eye; parietal fontanel reaching as a groove to tip of occipital process; bridge between fontanels flush with surface of skull.

Mouth moderate, angle of lower jaw below anterior margin of pupil; maxillary broad, its margin much curved, reaching beyond origin of eye; no maxillary teeth; premaxillary with a minimum of horizontal extent, with two series of graduated notched teeth, the first series consisting of 3 closely crowded teeth in front of the second and third of the second series, the middle one of the three withdrawn from the line of the others and in the interspace between the second and third of the inner series which consists of 5 teeth; mandible with 3 teeth in front, the second one largest, crowded out of line, in advance of the remainder (as in *Moenkhausia costae* and to a less extent in *Ephippicharax franciscoensis*), many minute teeth on the sides of the jaw, the second tooth engages the anterior series of the upper jaw.

Gill-membranes free from each other and from the isthmus; gill-rakers long and slender, 9 + 19. Cheeks entirely covered by the second suborbital; first suborbital very long, to below middle of eye.

No predorsal spine; dorsal over ventrals, origin of dorsal nearer snout than caudal; adipose fin narrow, slightly in front of end of anal; anal long, its origin just below end of dorsal; ventrals minute, not to anal, tip of pectorals when laid straight back 5 rows of scales above first half of ventrals.

Scales cycloid, with widely diverging radial striae, lateral line complete, nearly straight from its fifth scale; anal scaled to second third; caudal scaled.

A large round humeral spot, over the 6th scale of the lateral line and midway between line and back.

Air-bladder large, the posterior portion a third longer than the anterior; obliquely placed, the posterior end just above the origin of anal; alimentary canal short.

Vertebrae 12 + 20; coracoids appressed and expanded dorsoventrally, causing the knife-edged breast, not expanded behind base of pectoral.

The structure of coracoids would indicate a strong pectoral action in this fish.

## THE FOSSIL CHARACINS.

Some fossil Characins have come from the Tertiary lignite mined at Taubaté on the Rio Parahyba, São Paula Brazil. These were first referred to the old genus *Tetragonopterus*. It is quite certain that those so far described do not agree with the modern conception of that genus. A series of X-ray photographs of living

characins shows that in the number of vertebrae and position of dorsal these fossils agree most closely with Brycon, Henochilus and Salminus. Dr. T. A. Cockerell finds that in the character of the scales they are very similar to the genus Salminus.

[In 1921 Dr. Cockerell described a new genus of Characins, from scales alone, from Tertiary, possibly Miocene, deposits at Huacho, Peru. These scales he compares with Acanthocharax and Bryconamericus. (See below.) They may or may not be related to these genera. *G. S. Myers*]

#### 54. LIGNOBRYCON, gen. nov.

*Lignum*, wood, and *Brycon*, a genus of characins.

TYPE.—*Tetragonopterus ligniticus* Woodward.

Dorsal on the caudal portion of the vertebral column, its origin and that of the anal equidistant from the base of the middle caudal rays. Insertion of the dorsal on about the 15th vertebra, between the 23d and 24th from the last; distance between origin of dorsal and origin of anal less than distance between dorsal and ventrals. Vertebrae 18 + 20.

This genus is characterized by the position of the dorsal, over the origin of the anal, very distinctly behind the middle of the body. In other respects it resembles the fossil Eobrycon and the living Brycon. In Brycon, the dorsal is inserted at a point between the 31st–33d vertebrae from the last and the vertebrae number 20 or 21 + 21, not counting the coalesced vertebrae.

HABITAT.—Tertiary deposits, São Paulo, Brazil.

#### LIGNOBRYCON LIGNITICUS (Woodward).

*Tetragonopterus ligniticus* WOODWARD, Rev. Mus. Paulista, 1898, **3**, pl. 67, fig. 4, 5, Cat. fossil fishes, 1901, **4**, p. 298, pl. 17, fig. 2, 3.

HABITAT.—Tertiary Lignite at Taubaté, São Paulo, Brazil.

Depth about 4, A. 30; orbit about 3 in the head; occipital process extending about one seventh to the dorsal; origin of dorsal much nearer origin of anal than origin of ventrals; origin of anal nearly equidistant from base of pectoral and base of middle caudal rays, on or in front of the vertical from the first dorsal ray.

#### 55. EOBRYCON Jordan.

ἑως, ἦ, dawn; *Brycon*, a genus of characins. Brycon of the eocene.

*Eobrycon* JORDAN, Univ. California publications, Geology, 1907, **5**, p. 140.

TYPE.—*Tetragonopterus arus* Woodward.

Dorsal inserted between about the 27th and 28th vertebrae counting from the last, entirely over the abdominal portion of the vertebral column.

HABITAT.—Tertiary Lignite, São Paulo, Brazil.

*Key to the Species.*

- a.* Origin of dorsal equidistant from origin of anal and origin of pectoral; depth about 3; anal basis about equal to the length of the head; highest anal ray reaching a little beyond middle of the base of the anal; ventrals not reaching anal, about equal to the highest anal ray; pectorals much longer than the ventrals, reaching beyond origin of the ventral fins; A. about 22. Vertebrae 42 (20 + 22?)..... 1. *avus* (Woodward).
- aa.* Origin of dorsal equidistant from origin of anal and origin of ventrals; depth 3.8; anal basis much shorter than head; highest anal ray about equal to the depth over last anal ray, its tip reaching the last third of the base, ventrals not reaching anal, a little longer than the highest anal ray; pectorals much longer than the ventrals. A. 20; vertebral 20(?) + 18; third suborbital leaving only a narrow naked margin behind it; frontal fontanel entirely separating the frontals.

2. *branneri* Eigenmann.1. *EOBRYCON AVUS* (Woodward).

*Tetragonopterus avus* WOODWARD, Rev. mus. Paulista, 1898, **3**, p. 66, fig. 3; Cat. fossil fishes, 1901, **4**, p. 298, pl. 17, fig. 1.

*Eobrycon avus* JORDAN, Univ. California publications, Geology, 1907, **5**, p. 140.

HABITAT.—Tertiary Lignite, Taubaté, São Paulo, Brazil.

The description in the Key is taken from Woodward.

The teeth of this fossil fish have not been described. X-ray photographs of the various types of characins show that in general characters *Eobrycon* agrees with the recent genus *Brycon*, of which it may be a synonym. Dorsal inserted between about the 27th and 28th vertebrae counting from the last, entirely over the abdominal portion of the vertebral column.

2. *EOBRYCON BRANNERI* Eigenmann, sp. nov.

Plate 81, fig. 1, 2.

HABITAT.—Tertiary Lignite, Taubaté, São Paulo, Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality
13197 I. Type	1	170	Tertiary Lignite, Taubaté, São Paulo, Brazil
13198 I. Paratype	1	175	Tertiary Lignite, Taubaté, São Paulo, Brazil

These specimens were sent to Indiana University by the late John Casper Branner of Stanford University, in whose honor the species is named.

In the type (fig. 1) the print of the adipose fin is faintly visible. The free portion of the scales with numerous divergent radial striae, the circuli between them numerous, prominent, wavy, finest toward the tip of the scale.



## 56. CHARACILEPIS Cockerell.

*Characilepis* COCKERELL, Proc. U. S. nat. mus., 1921, **59**, p. 19.

TYPE.—*Characilepis tripartitus*.

“Scales small, subquadrate to transversely elongate; apical field broadly sculptureless, without radii, circuli, or ctenoid structures; basal field with broadly spaced transverse or arched circuli (sometimes angulate in middle), but no radii; between the basal and apical fields a variable area (sometimes only narrowly developed, and at sides) of transverse circuli set very close together, and quite independent of the other series. Lateral line very distinct.”

## CHARACILEPIS TRIPARTITUS Cockerell.

*Characilepis tripartitus* COCKERELL, Proc. U. S. nat. mus., 1921, **61**, p. 19, figs. 1-7 (Tertiary deposit at Huacho, Peru).

HABITAT.—Tertiary deposit at Huacho, Peru.

“Scales, 3 to 4 mm. broad, polished.

“A lateral line scale may be considered the type. The scale shown in figure 2 illustrates the sharp limitation of the sculptured area, as in the modern *Bryconamericus*. In the marine (Hemirhamphid) genus *Hyporhamphus* there are two sets of circuli, broadly and narrowly spaced, but one series is directly continuous into the other, as the figure shows. In the Characidae the two sets have become entirely distinct, as is shown in *Acanthocharax microlepis* and in *Characilepis*. In *Bryconamericus* the condition resembles that of the *Characilepis* scale in figure 2, except that the transverse closely placed circuli have disappeared. In *Charax gibbosus* there is a peculiar broken transverse sculpture along the line limiting the widely spaced circuli, and near the nucleus this sometimes takes the form of a network. It seems to be derived from the other set of circuli.” Cockerell.

## SUPPLEMENT.

BY GEORGE S. MYERS.

(Stanford University, California)

The present part concludes all of the monograph of the American characiform fishes that had been completed by Dr. Eigenmann at the time of his death. A review of the genus *Brycon* had been completed by him, but it was not in form for printing. As it stands, the monograph covers approximately one third of the American characins, grouped by Dr. Eigenmann under the comprehensive family Characidae.

The volume has been issued in parts as follows: Part one, pages 1–102, with plates 1, 2, 3, 4, 5, 6, 7, 8, 12, 14, 15, 16, 95, 98, 100, and 101, in August 1917; part two, pages 103–208, with plates 9, 10, 11, 13, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 33, 78, 79, 80, and 93, in January 1918; part three, pages 209–310, with plates 30, 31, 32, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 61, 62, 64, 66, 69, 85, 87, 89, and 92, in July 1921; part four, pages 311–428, with plates 34, 35, 36, 37, 38, 39, 56, 58, 59, 60, 65, 67, 68, 75, 76, 77, 84, 86, 88, 90, 91, 96, 97, and 99, in May 1927; and the present part five, pages 429–574, with plates 57, 63, 70, 71, 72, 73, 74, 81, 82, 83, and 94, in 1929.

Due to the period of time which has elapsed between the appearance of the first and last parts, it has been necessary several times to revise the unpublished portion of the manuscript. That section comprising parts four and five was revised by Dr. Eigenmann, with the present writer's assistance, in the summer of 1925 and sent to the editor. It was returned to me in the fall of 1926 and was again gone over, Dr. Eigenmann's health not permitting his aid. Part four was then printed and proof of this was corrected by Mrs. Eigenmann (pages 311–332) and myself (pages 333–428).

Part five was sent to me for final revision in the summer of 1928. While I have endeavored not in any way to alter Dr. Eigenmann's conclusions, certain slight but apparently necessary changes have been made, *e.g.*, in *Mimagoniates*. All such alterations bear my initials.

The Supplement is entirely the work of the present writer, excepting where noted or where it is obviously that of someone else, and he takes full responsibility for all statements therein. It has been attempted to complete all references up to July 1, 1928.

To the bottom of page 15, add:

THE IRWIN EXPEDITION.<sup>1</sup>

The Irwin Expedition of Indiana University, 1918 to 1919, carried the survey of the rivers of the Pacific slope of South America from northern Peru to Puerto Montt, in southern Chile. It also descended, on the Atlantic side, into the Hualaga Basin to two thousand feet, the Chanchamayo to two thousand feet, the Urubamba to three thousand feet, and surveyed the Titicaca Basin. The fishes of the Chira, the Piura, the Rimac and Chili Rivers of this region were considered in "The Fishes of Western South America," Part One, 1922.<sup>2</sup> The fishes of the rivers of Chile are being considered in the Memoirs of the National Academy of Sciences.<sup>3</sup>

The collections were made by myself, assisted by Miss Adele Eigenmann (now Dr. Adele Eigenmann Eiler) and Dr. William Ray Allen. The specimens collected are deposited in the Indiana University Museum.

THE ALLEN EXPEDITIONS.<sup>4</sup>

Dr. William Ray Allen was a member of the Irwin Expedition, described above. He collected from Lima across the Andes to Lake Junin, Cerro de Pasco and down to Huanuco and Tinga Maria, and from Mollendo across the Andes to Lake Titicaca, Lake Poopo and the region about these lakes.

In 1920, leading the Centennial Expedition of Indiana University, he crossed the continent from Lima to Pará, via Oroya, La Merced and Pichis, the Pachitea and the Ucayali to Iquitos, Manáos and Pará. Dr. Allen also made extensive collections in the Marañón and some of its tributaries between the Pongo de Manseriche and Iquitos. His collection from the Huallaga Basin is the most extensive so far made.

A grant of five hundred dollars from the American Association for the Advancement of Science was devoted toward Dr. Allen's expenses. The collections secured are in Indiana University.

THE MULFORD BIOLOGICAL EXPLORATION OF THE AMAZON BASIN.

Mr. (now Dr.) Nathan Everett Pearson, as a member of the Mulford Biological Exploration of the Amazon Basin, June 1921 to March 1922, collected

<sup>1</sup> This and the following accounts of expeditions, excepting of the Ternetz Expedition, were written by Dr. Eigenmann.

<sup>2</sup> Mem. Carnegie mus., 1922, 9, pp. 1-346, pl. 1-38.

<sup>3</sup> This account has recently appeared. "The Fresh-water Fishes of Chile," Mem. nat. acad. sci., 1927, 22, pp. 1-63, pl. 1-16. *G. S. Myers.*

<sup>4</sup> See Science, N.S., 53, pp. 377-379, and Indiana University alumni quarterly, 8, No. 2, pp. 111-140.

in the Rio Beni from La Paz to Cachuela Esperanza, just above the Madeira. These collections were described by Mr. Pearson in "The Fishes of the Eastern Slope of the Andes, I, The Fishes of the Rio Beni Basin, Bolivia, collected by the Mulford Expedition."<sup>1</sup>

The funds for this expedition were provided from grants from the Bache Fund of the National Academy of Sciences, the University of Michigan, and Indiana University. The first series of specimens is in Indiana University. Other series have been distributed to the University of Michigan and the National Museum.

In addition to the above, Mr. Pearson, from June 1923 to October 1923, collected from Pacasmayo, in northern Peru, along the Rio Jequetepeque and across the Andes to Cajamarca and down to the Marañon. The collection is in Indiana University. An account of these fishes is in preparation.

#### THE TERNETZ EXPEDITION.

The exploration which was to have completed Dr. Eigenmann's survey of the fresh-water fishes of South America was carried on by Dr. Carl Ternetz, a veteran fish-collector in South American streams. Dr. Ternetz began his collecting in the highlands of Goyaz, at the headwaters of the Rio Tocantins, in September 1923. Descending the Tocantins and collecting extensively as he went, he reached Pará in April 1924. After making large collections there, he ascended the Amazon, stopping for long periods at Santarém at the mouth of the Tapajos, and at Manáos. Starting up the Rio Negro from Manáos about the first of January 1925 he obtained important materials at Santa Isabel, Bom Jardim, Camanáos, São Gabriel, Cucuhy, and many other places. From Cucuhy he proceeded up-river into Colombia and Venezuela and into the Cassiquiare Canal. Many important collections were made in the Cassiquiare, whence he entered the Orinoco. The first Orinoco material was from the Bifureation and Tama-Tama, and from there Dr. Ternetz proceeded down-river. He arrived at Caicara, in the Middle Orinoco, in May 1925, and here finished his collecting for Dr. Eigenmann.

The fishes obtained by Dr. Ternetz on this most remarkable trip doubtless comprise the largest single collection of fresh-water fishes ever made in any continent, with the sole exception of that brought back by the Thayer Brazilian Expedition in 1866. A few of the Doradidae obtained by Dr. Ternetz were recorded by Dr. Eigenmann and several new forms were described by the present

<sup>1</sup> Indiana univ. studies, (1924) 1925, No. 64.

writer, but the bulk of the collection is still unexamined. The new *Characius* belonging to the subfamilies, included in the present volume, will be found recorded in these addenda. The Ternetz Collection is in Indiana University.

To the list of genera, pages 32 to 37 add:

<i>Original name</i>	<i>Authority</i>	<i>Date</i>	<i>Current name</i>
Erythrichthys	Bonaparte	1833	Erythrinus
Mormyryncbus	Swainson	1839	Anostomus
Histiodromus	Gistel	1848	Anostomus
Heterythrinus	Günther	1864	Erythrinus
Triportheus	Cope	1872	Chalceus
Brachychalcinus	Boulenger	1872	
Myloplus	Gill	1895	
Monostichodus	Vaillant	1900	Hemistichodus
Dermatocheir	Durbin	1909	Hyphessobrycon
Tylobronchus	Eigenmann	1912	
Aphyodite	Eigenmann	1912	
Acanthocharax	Eigenmann	1912	
Heterocharax	Eigenmann	1912	
Xiphocharax	Fowler	1913	
Carlia	Meek	1914	Rhoadsia
Gastropristis	Eigenmann	1915	
Rooseveltiella	Eigenmann	1915	
Pristobrycon	Eigenmann	1915	
Pseudocheirodon	Meek & Hildebrand	1916	
Apareiodon	Eigenmann	1916	
Entomolepis	Eigenmann	1917	
Microstomatichthyoborus	Nichols & Griscom	1917	
Bertonolus	Fowler	1918	
Characilepis	Cockerell	1920 <sup>1</sup>	Fossil
Tristichodus	Boulenger	1920	
Phenacobrycon	Eigenmann	1922	
Leporinodus	Eigenmann	1922	
Paradistichodus	Pellegrin	1923	
Hemigrammocharax	Pellegrin	1923	
Phagoborus	Myers	1924	replaces Neoborus
Clupeacharax	Pearson	1925	
Monotocheirodon	Eigenmann & Pearson	1925	
Prodontocharax	Eigenmann & Pearson	1925	
Acrobrycon	Eigenmann & Pearson	1925	
Arnoldichthys	Myers	1926	
Thrissocharax	Myers	1926	= Hemigrammocharax
Hemigrammuopetersius	Pellegrin	1926	
Hemigrammalestes	Pellegrin	1926	Synonym of Phenacogrammus
Clupeocharax	Pellegrin	1926	(not Clupeacharax Pearson)
Microdistichodus	Pellegrin	1926	

<sup>1</sup> *Erythrinolepis* COCKERELL, 1919, fossil, thought to be related to the Characidae, is nevertheless placed by Cockerell in a separate family, Erythrinolepidae.

<i>Original name</i>	<i>Authority</i>	<i>Date</i>	<i>Current Name</i>
Rachoviscus	Myers	1926	
Atomaster	Eigenmann & Myers	1927	
Gnathodolus	Myers	1927	
Atopomesus	Myers	1927	
Othonocheirodus	Myers	1927	
Elachocharax	Myers	1927	
Creagrudite	Myers	1927	
Lonchogenys	Myers	1927	
Piabarchus	Myers	1928	
Piabucidium	Myers	new genus	Subgenus of Piabucus
Lignobrycon	Eigenmann	new genus	Fossil
Bryconacidnus	Myers	new genus	

Part 1, pp. 34 to 37, insert the following corrections:

Delete *Neolebias* Boulenger, 1899, p. 34. See Steindachner, 1894.

*Holoshesthes* Eigenmann, 1903, p. 35, should retain its original spelling.

*Colosoma* Eigenmann, 1903, p. 35, should read *Colossoma*.

*Mylosoma* Eigenmann, 1903, p. 35, should read *Mylossoma*.

*Sealeina* Fowler, 1906, p. 35, equals *Metynnus* (*vide* Dr. E. Ahl.)

The date 1911, after *Bivibranchia* Eigenmann, p. 36, should be 1912.

*Rhodsia* Fowler, 1911, p. 36, should read *Rhoadsia*.

*Argopleura* Eigenmann, 1913, p. 37, is a distinct genus.

*Xenurocharax* Regan, 1913, p. 37, equals *Argopleura*.

*Phenagoniates* Eigenmann & Wilson, 1914, p. 37, should retain the original spelling.

*Compsoura* Eigenmann, 1915, p. 37, should read *Compsura*.

Page 50, instead of "Key to the Genera" read: *Key to the Genera of the subfamily Tetragonopterinae*.

Page 56, to the synonymy of *Tetragonopterus argenteus*, add:

*Tetragonopterus argenteus* Pearson, Indiana univ. studies, 1925, No. 64, p. 37 (Rio Beni: Cachuela Esperanza, Ixiamas).

Page 73, to the synonymy of *Moenkhausia doceana*, add:

*Moenkhausia doceana* STEINDACHNER, Flüssf. Südamer., 1915, 5, p. 28 (Rio Docé).

Page 75, in the synonymy of *Moenkhausia chrysargyrea*, for

*Moenkhausia chrysargyrea leucopornis* FOWLER, read *Moenkhausia chrysargyrea leucopomis* Fowler.

Page 77, to the synonymy of *Moenkhausia comma*, add:

*Moenkhausia comma* STEINDACHNER, Flüssf. Südamer., 1915, 5, p. 31, taf. 4, fig. 6 (Maguary, Pará, Rio Guam, Cudajas).

Page 78, before *Moenkhausia melogramma*, insert the following two species:

#### 7a. MOENKHAUSIA PITTIERI Eigenmann.

*Moenkhausia pittieri* EIGENMANN, Indiana univ. studies, 1920, No. 44, p. 10, pl. 3 (Conejo and Maracay).

HABITAT.— Vicinity of Lake Valencia, Venezuela.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
15136a I. Type	1	58	Concejo, Rio Tiquirito	Pearse
15136b I. Paratypes	27	33-60	Concejo, Rio Tiquirito	Pearse
15137 I. Paratype	1	45	Maracay, Rio Bue	Pearse

Head 4; depth 2.16 to 2.5; D. 11; A. 26 to 29; scales 7-35-6; eye 2.5 equals interorbital.

Deep, compressed, ventral profile regularly arched from chin to end of anal, dorsal profile slightly depressed over the eye; preventral area narrowly rounded, postventral area narrowly compressed; predorsal area narrowly keeled, with a median series of slightly notched scales near the dorsal and lateral scales with their edge bent over the middle further forward.

Occipital process equals one-fourth the distance from its base to the dorsal, bordered by three scales; fontanels rather broad, the frontal fontanel about three-fourths as long as the parietal without its groove; suborbital with a strongly convex margin, the naked area of the cheek increasing in width from the angle of the suborbital forward; maxillary a little less than 3 in the head, mandible very little more than 2; four or five teeth in the outer series of the premaxillary, five in the inner series, three or four in the maxillary; five teeth of nearly equal size (the last sometimes considerably smaller) in each ramus of the mandible, abruptly smaller teeth on its side.

5 + 8 gill-rakers.

Scales regularly imbricate, lateral line but little decurved; anal with a sheath of a few scales along the base of its anterior third or fourth; caudal lobes with but few small scales along the outer part of their basal fourth. Scales with but few divergent striae.

Fins all large; origin of dorsal equidistant from snout and tip of adipose or caudal, the third, fourth, and fifth rays highest, reaching to the adipose or the caudal; adipose fin well developed; caudal lobes 2.75 to 3.25 in the length; anal high, with a distinct lobe in front, the fifth to the seventh ray highest, reaching to the base of the fifth to sixth ray from the last, origin of anal about equidistant from the caudal and the middle of the eye, ventrals prolonged, reaching in extreme cases to the twelfth anal ray; pectorals about equal to the length of the head.

No caudal or humeral spots; a narrow lateral band; dorsal, ventrals and anal dusky.

In general appearance this species resembles *Ephippicharax* but lacks a predorsal spine. None of the specimens have hooklets on the anal rays usually found on mature males of this genus. Vertebrae 13 + 17.

#### 7b. MOENKHAUSIA METAE Eigenmann.

*Moenkhausia metae* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 234, pl. 34, fig. 3 (Barrigón, Villavieancio).

HABITAT.—Headwaters of the Meta, eastern Andes of Colombia.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
15026 I. Types and Paratypes	20	57-74	Barrigón	Gonzales
3926 C. } Paratypes	10	52-63	Villavieancio	Gonzales
13951 I. }				

Head 4 or nearly 4; average depth 2.5 in the length; D.11; A. 20-22; scales 6 (more rarely 7)-34 to 36-5 (more rarely 4); eye 2.7-3; interorbital about equal to the eye; maxillary with 2 or 3 teeth; 4 to 6 teeth in the front row of the premaxillary.

Shaped like *M. barboursi*; preventral area rounded, postventral area narrowly so; predorsal area narrowly rounded, with a median series of nine scales; occipital process 4-4.5 in the distance from its base to the dorsal, bordered by three scales on the side; interorbital convex; second suborbital leaving one-fifth or more of the cheek naked; maxillary 2.8-3 in the head; equal to the distance from the snout to the pupil; usually four or five teeth in the front series of the premaxillary, five teeth in the second series; maxillary usually with two, less frequently with three, teeth; mandible with four large teeth, about nine abruptly smaller teeth on the sides; gill-rakers about 5 + 9 to 11. Scales of the sides with four or more slightly diverging striae; anal sheath consisting of five or six scales along the bases of the anterior rays; scales of caudal largely lost.

Origin of dorsal equidistant from tip of snout and caudal, the longest rays longer than the head, 3.5 in the length, equal to the caudal lobes; anal lobe almost equal to the length of the head without the opercle, reaching to or very nearly to the base of the last ray; origin of ventrals nearer to base of last anal ray than to tip of snout; pectorals reaching base or two scales beyond base of outer ventral rays.

A dark median lateral line; anal dark at margin. One or two faint humeral spots or none.



Page 79, before *Moenkhausia oligolepis*, insert:

Sa. MOENKHAUSIA SIMULATA Eigenmann and Pearson, sp. nov.

Plate 57, fig. 3.

HABITAT.—Marañon System.

15860 I. Cotypes                      10                      35-72 mm.                      Creek at Puerto Burmedez                      Allen

Very closely related to *M. latissima*, from which it is distinguished by having the horizontal dark lines through the center of the scales.

Head  $3\frac{1}{2}$  to  $3\frac{2}{3}$ ; depth 2 to 2.1; D. 11; A. 32 to 33; scales 5-32 to 34-4; eye 2.4 to 2.6; interorbital in the larger specimen equal to the eye diameter; strongly compressed; profile depressed over the eyes; dorsal and ventral profiles equally arched; preventral area narrowly rounded; postventral area compressed and keeled, the scales bent over at the middle; occipital process narrow, its length slightly less than the eye diameter, bordered by three scales; the fontanel narrow, the anterior less than half the length of the posterior, the posterior extending to the tip of the occipital process; second suborbital leaving a narrow naked area between it and the lower limb of the preopercle; 3 teeth in the outer series of the premaxillary, 5 in the inner series; 2 or 3 teeth in the maxillary; lower jaw with 4 graduated teeth followed abruptly by several smaller ones; gill rakers 9 + 9, the longest  $\frac{1}{3}$  the eye diameter; scales regularly imbricate; a few divergent striae, the margins not crenate; anal sheath composed of a single series of scales extending  $\frac{2}{3}$  the anal length; origin of the dorsal slightly nearer the tip of the snout than the base of the caudal; tip of the dorsal when depressed separated from the adipose by four scales; anal truncate; pectorals reaching tip of the axillary scale; ventrals to anal.

An indistinct caudal spot; humeral spot vertical, indistinct; horizontal dark lines through the middle of the scale series.

(This species has been mentioned, with a short account of the color, as *Astyanax simulatus* Eigenmann, by Pearson, Indiana univ. studies, (1924) 1925, No. 64, p. 41. As a distinguishing character is given, it is possible that this reference may stand as the original description, and the species be known as *Moenkhausia simulata* (Eigenmann).)

Page 79, to the synonymy of *Moenkhausia oligolepis*, add:

*Moenkhausia oligolepis* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 235 (Caño Carniceria, Colombia).

Page 82, to the synonymy of *Moenkhausia sanctae-filomenae*, add:

*Moenkhausia sanctae filomenae* Pearson, Indiana univ. studies, (1924) 1925, No. 64, p. 37 (Rio Beni: Ixiamas, Lake Rogoagua, Reyes).

Page 85, to the synonymy of *Moenkhausia grandisquamis*, add:

*Moenkhausia grandisquamis* STEINDACHNER, Flüssf. Südamer., 1915, **5**, p. 32, taf. 4, fig. 1 (Bergandal, Albina, in Dutch Guiana; Rupununi, British Guiana; Pará, Santarém, Boa Vista, Conceição, Serra Grande, Bem Querer, Serra do Mellon on Rio Surumú, and Rio Purús, Brazil).

Page 89, to the synonymy of *Moenkhausia bondi*, add:

*Moenkhausia bondi* FOWLER, Proc. acad. nat. sci. Phila., 1926, **78**, p. 255 (Rio Inhangpy, Pará).

This is an interesting extension of the range of this Guiana species, as Fowler remarks, though it might have been expected. Less to be expected was its discovery at Iquitos, on the Peruvian Amazon, by Dr. W. R. Allen. This discovery will be reported elsewhere.

Page 95, to the synonymy of *Moenkhausia dichroua*, add:

*Moenkhausia dichroua* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 37 (Rio Beni Basin: Rurrenabaque, L. Rogoagua, Cachueta Esperanza, Popoi R.).

Page 97, to the synonymy of *Moenkhausia intermedia*, add:

*Moenkhausia intermedia* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 37 (Rio Beni Basin: Reyes, Ivon, L. Rogoagua).

Page 103, to the synonymy of *Moenkhausia lepidura gracillima*, add:

*Moenkhausia lepidura* FOWLER, Proc. acad. nat. sci. Phila., 1926, **78**, p. 259 (Vic. Buenavista, Dept. Santa Cruz, Bolivia).

Page 103, before *Moenkhausia colletti*, insert:

25a. *MOENKHAUSIA CRISNEJAS* Pearson, sp. nov.

17611 I. Cotypes                      34-44 mm.                      Paipay, Rio Crisnejas, Peru                      Pearson

"Caudal base scaled, the scales rather large and extending backward along the middle of the lobes. Lateral line complete. The second suborbital not in contact with the preopercle below. But for the nature of the second suborbital the species would belong to *Knodus*.

"Head 4; depth 3.6 to 3.8; D. 10; A. 15; scales 4.5-35 to 37-2.5. Lateral line complete. Eye about 3; interorbital equal to the eye diameter. Frontal fontanel narrow, its length one-third of that of the parietal. Occipital process 0.35 of the eye diameter. Second suborbital leaving a wide naked area below. Mouth moderately large; the maxillary bone 0.7 of the eye diameter, extending to below the anterior margin of the eye. Teeth tricuspid, or, if five cusps are present, the lateral ones are indistinct. Maxillary with 3 to 4 three- or five-pointed teeth. Two or three teeth in the first series of the premaxillary; the third sometimes withdrawn to the second series; 4 or 5 teeth in the second series. Mandible with 4 or 5 large teeth followed by as many smaller ones. Gill-rakers short, 0.2 of the eye diameter, 8 + 11. Predorsal line scaled; preentral area narrowly rounded.

Origin of the dorsal nearer the tip of the snout than to the base of the caudal, its margin rounded. Anal slightly emarginate, its origin slightly posterior to the last dorsal ray. Ventrals not reaching anal, their origin in advance of the origin of the dorsal. Pectorals not reaching the anal. A vertical humeral spot; a lateral silvery band." *N. E. Pearson.*

Page 109, to the synonymy of *Moenkhausia cotinho*, add:

*Moenkhausia cotinho* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 38 (Beni Basin: Cachuela Esperanza).

Page 114, before *Knodus*, insert:

29a. *MOENKHAUSIA MIANGI* Steindachner.

*Moenkhausia miangi* STEINDACHNER, Flússf Südamer., 1915, 6, p. 29 (Miang, on the boundary of Venezuela).

HABITAT.—Miang, Venezuela boundary.

“Obere Profillinie des Kopfs sehr schwach konvex oder vollkommen gerade, viel rascher nach hinten ansteigend, als die Nackenlinie unter geringer Konvexität zum Beginn der Dorsale sich erhebt. Bauchlinie bis zur Ventrals stärker gekrümmt als der gegenüberliegende Teil der Rückenlinie. Humeralfleck schwärzlich, scharf ausgeprägt, vertikal gestellt, unterhalb der Seitenlinie minder intensive gefärbt und zu einem Streifen sich verschmälernd. Hinter dem Humeralfleck eine helle Zone, nach hinten begrenzt von einem stark verschwommenen, nur wenig dunkleren Fleck, welcher sich in einen mehr minder deutlich hervortretenden grau violetten seitlichen Längsstreif oder in eine etwas breitere Längsbinde bis zur Caudale fortsetzt. Schwanzfleck sehr gross, zur Hälfte am basalen Teil der Caudale gelegen. Nackenlinie stumpfkantig. Schwanzstiel stark komprimiert. Schnauze stumpf gerundet. Kopflänge zirka 3.25 (bei jungen Exemplaren) bis  $3\frac{5}{7}$  mal, grösste Rumpfhöhe 2.4 bis 2.5 mal in der Körperlänge (ohne Caudale), Augenlänge 2.5 (bei jungen Exemplaren) bis  $3\frac{3}{4}$  mal, Schnauzenlänge 3 (bei jungen Exemplaren) bis 4 mal, Breite des Interorbitalraumes 3 bis 3.2 mal in der Kopflänge enthalten.

“D. 2/9. A. 3-4/23-24. V. 1/7. L. l. 35-36 (+ 2-3 auf d. C.). L. tr. 7/1/5 1/2-6.

“Schnauze stumpf gerundet. Mundspalte endständig, bis zum hinteren Ende des Oberkiefers gemessen 2.2 bis  $2\frac{1}{11}$  mal in der Kopflänge enthalten, somit über den vorderen Augenrand zurückreichend, länger als breit. Die Suborbitalia decken die Wangen bis auf einen schmalen Streif. Bei älteren Exemplaren, übertrifft die Breite des Interorbitalraumes ein wenig die Augenlänge. Der

hintere Augenrand fällt ein wenig näher zum hinteren Kopfrande als zum vorderen Schnauzenende.

“Der Kiemendeckel ist bei jungen Exemplaren zirka 2 mal, bei alten 2.5 bis 3.75 mal höher als läng, der gerundete Vordeckelwinkel ein wenig kleiner als ein rechter, der aufsteigende Vordeckelrand geradlinig und ein wenig nach hinten und unten geneigt.

“Die Höhe der Dorsale steht der Kopflänge durchschnittlich nur wenig nach. Der Beginn derselben fällt in vertikaler Richtung über die Basis der Ventrale und liegt etwas näher zum vorderen Kopfe als zur Basis der Caudale. Der hintere obere Rand der Dorsale ist verkehrt schwach S-förmig gebogen. Der Abstand der Dorsale von der Fettflosse ist etwas veränderlich, doch bei der Mehrzahl der untersuchten Exemplare nahezu so lang wie der Kopf.

“Die Länge der Pectorale ist zirka 1.25 mal, die der Ventrale 1.66 bis  $1\frac{5}{7}$  mal in der Kopflänge enthalten. Die Spitze der Brustflosse reicht genau oder nahezu bis zur Basis der Ventralen, das hintere Ende der letzteren bis zur Analgrube oder bis zum Beginn der Anale. Die Basis der Anale ist genau oder nahezu so lang wie der Kopf und die grösste Höhe der Flosse zirka  $1\frac{3}{7}$  bis  $1\frac{5}{7}$  mal in ihrer Basislänge enthalten.

“Caudale am hinteren Ende tief dreieckig eingebuchtet, ebenso lang wie der Kopf.

“Die Länge des Occipitalfortsatzes gleicht  $\frac{1}{3}$  des Abstandes seiner Spitze vom Beginn der Dorsale. 10 bis 11 Schuppen liegen an der Nackenlinie hinter der Spitze des Occipitalfortsatzes bis zur Dorsale. Rumpfschuppen mit zahlreichen zarten Radien, die nur wenig nach hinten divergieren oder parallel zueinander laufen.

“Rumpf goldbraun, dunkler gegen den Rücken zu, Kopf gelblichweiss mit Silberschimmer.

“46 bis 108 mm. lang.” *Steindachner*.

Page 114, line 3, for TYPE.—*Bryconamericus breviceps* Eigenmann, read:

TYPE.—*Knodus meridae* Eigenmann.

The name *Knodus* appeared first in 1910, in the description of *Knodus meridae*. As this is the only species referred to the genus at its first appearance, it automatically becomes the genotype. *Knodus* was first characterized in 1917, in the key to the Tetragonopterinae (*supra*, p. 50), in Part One of the present work. *Knodus meridae* was, in 1917, still the only species referred to the genus, since Part Two of the present work containing the account of *Knodus* and its

species, did not appear until 1918. *Knodus* must date from 1910, with its type *Knodus meridac*.

Page 118, before *Knodus breviceps*, insert:

3a. *KNODUS MEGALOPS* Myers, sp. nov.

HABITAT.—Rio Pichis, Peru.

17668 L.                      1                      59 mm.                      Rio Pichis, Puerto Bermudez                      Allen

Head 3.8. Depth 2.9. Dorsal 10. Anal 23. Scales 5–36–4, predorsal 12 or 13, not regular. Eye 2.2 in head. Snout half eye. Interorbital 1.33 in eye.

Basal half of outer caudal rays scaled. Deep, upper and lower profiles about the same, almost straight to the dorsal and pelvic origins, thence rather straight to the caudal.

Snout short, very blunt, jaws equal anteriorly. Great suborbital in contact with lower limb of preopercle below, without a naked angle below its anterior corner; a narrow naked margin behind. Maxillary .66 eye. Occipital process 7.5 in the distance from its base to the dorsal.

Five narrowly tricuspid teeth on each side in the outer premaxillary row, the second a little retreated, the last directed outward. Inner series with 4 broader teeth. Maxillary with 3 teeth near its upper angle. Dentary with 4 graduated teeth on each side, followed by small teeth.

Dorsal origin midway between caudal base and anterior margin of eye. Anal originating under about the fourth dorsal ray. Pectorals considerably overlapping pelvics. Pelvics inserted midway between snout tip and base of last anal ray, the tips just reaching anal origin. A silvery lateral band; a faint caudal spot.

Page 118, to the synonymy of *Knodus breviceps*, add:

*Knodus breviceps* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 38 (Rio Beni Basin: Espia, Rio Iniqui, Popoi R., Rurrenabaque, Rio Colorado, Huachi, Cachuela Esperanza).

Dr. Pearson is not sure that all of his material belongs to this species.

Page 123, before *Markiana*, insert:

4a. *BERTONIOIUS* Fowler.

For Dr. Arnaldo de Winkelried Bertoni

*Bertoniolus* FOWLER, Proc. acad. nat. sci. Phila., 1918, p. 141.

TYPE.—*Bertoniolus paraguayensis* Fowler.

Teeth of premaxillary covered by lip; five 5-pointed teeth in the inner series of each side, four tricuspid teeth on each side in outer series. Mandibular teeth uniserial, mostly 5-pointed. Gill-rakers lanceolate (setiform). Preventral area

evenly convex, squamation normal. Maxillary simply curved, slipping below preorbital, about half its upper edge shielded. Caudal normally forked, covered for about one third its length with large scales. Lateral line complete, slightly decurved, parallel with rows of scales below. Predorsal squamation normal, the median series not small. Anal slightly emarginate, scaled for half its width. Scales all cycloid. No procumbent dorsal spine. Great suborbital in contact with subopercle below.

This genus is related to *Knodus* and *Moenkhausia*, but closely approaches *Markiana*.

HABITAT.—Paraná Basin.

#### 1. *BERTONIOLUS PARAGUAYENSIS* Fowler.

*Bertoniolus paraguayensis* FOWLER, Proc. acad. nat. sci. Phila., 1918, p. 141, fig. (Puerto Bertoni).

HABITAT.—Puerto Bertoni, near Asuncion, Paraguay.

Head  $3\frac{2}{3}$ ; depth  $2\frac{3}{5}$ ; dorsal II, 9; anal II, 27; pectoral I, 11; ventral I, 7; scales 43 in lateral line to caudal base and three more on latter; 9 scales above lateral line and ten below; about 17 predorsal scales; snout  $3\frac{1}{3}$  in head; eye  $3\frac{1}{2}$ ; maxillary  $2\frac{1}{4}$ ; interorbital  $2\frac{7}{8}$ ; first branched dorsal ray 1; first branched anal ray  $1\frac{7}{8}$ ; least depth of caudal peduncle  $2\frac{1}{4}$ .

Apparently no maxillary teeth. Rakers 10 + 16, lanceolate, slender, about  $\frac{2}{3}$  gill-filaments which are 2 in eye. Pseudobranchiae about half as long as gill-filaments.

Dorsal origin about midway between snout tip and hind edge of adipose fin. Origin of adipose little nearer depressed dorsal tip than caudal base. Anal origin nearly opposite hind dorsal edge or about midway between hind preopercular edge and caudal base. Pectoral reaches slightly beyond ventral origin, though not quite to that of dorsal. Ventral inserted nearer anal than pectoral origin, reaching the latter.

A horizontally ellipsoid humeral spot, smaller than eye. A dark streak on peduncle, continued out to tips of central caudal rays. Dorsal slightly tinged with dusky, fins otherwise plain. (*Condensed from Fowler.*)

Type and only known specimen 97 mm. total length.

Page 124, to the synonymy of *Markiana nigripinnis*, add:

*Markiana nigripinnis* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 38 (Reyes, Bolivia).

Line 12, for HABITAT.—La Plata Basin, read:

HABITAT.—La Plata and Rio Beni Basins.

Page 125, to the synonymy of *Gymnocorymbus thayeri*, add:

*Moenkhausia ternetzi* STEINDACHNER, Flüssf. Südamer., 1915, 5, p. 26, taf. 3, fig. 6 (Rio Medonho north of Victoria, Rio Itapicuru at Caxias).

*Moenkhausia thayeri* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 38 (Cachuela Esperanza, Rio Beni).

Steindachner's records are interesting as considerable extensions of the range of this fish. He synonymizes *G. thayeri* with *G. ternetzi* but his specimens seem to have been identical with the former.

Pearson records both species from the Beni Basin. It is indeed unfortunate that he did not publish careful comparisons and explain such a remarkable and interesting distribution.

Line 5, for HABITAT.—Amazon, read:

HABITAT.—Amazon, Rio Beni, and Rio Itapicuru.

Page 127, to the synonymy of *Gymnocorymbus ternetzi*, add:

*Gymnocorymbus ternetzi* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 38 (Lake Rogoagua, Reyes, Beni Basin).

Line 14, for HABITAT.—Paraguay and Guaporé Basins, read:

HABITAT.—Paraguay, Guaporé and Beni Basins.

Page 128, line 9, for THAYERIA OBLIQUA Eigenmann, read THAYERIA OBLIQUA Eigenmann.

Page 140, *Hemigrammus coeruleus*. Numerous specimens collected by Dr. Ternetz in Igarapé do Mai Joana near Manáos, were entirely of a most gorgeous shade of deep vermilion when unpacked. This coloration extended to all parts of the body and fins, slightly paler, of course, towards the fin tips and venter.

Page 141, to the synonymy of *Hemigrammus unilineatus*, add:

*Hemigrammus unilineatus* FOWLER, Proc. acad. nat. sci. Phila., 1926, 78, p. 254 (Pará).

Page 146, *Hemigrammus marginatus*, Dr. Eigenmann has recorded specimens from Venezuela, as follows:

*Hemigrammus marginatus* EIGENMANN, Indiana univ. studies, 1920, No. 44, p. 10 (Maracay, Isla del Buro, Venezuela).

He states that they differ from typical specimens in having but one maxillary tooth. The specimens must be re-examined before the record can be accepted.

Page 152, line 14, for *Hemigrammus matei* Eigenmann, read *Hemigrammus mattei* Eigenmann. This species is named after the late Herr Paul Matte, Berlin aquarist, who presented the type to Dr. Eigenmann. The spelling was a typographical error in the Princeton Patagonia Report, and the error was inadver-

tently carried on. The locality of the type should read, ?Argentina, as it is given on the original label in the Indiana collections.

Page 157, to the synonymy of *Hemigrammus ocellifer*, add:

*Hemigrammus ocellifer* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 39 (L. Rogoagua).

Page 159, before *Hemigrammus boulengeri*, insert:

15a. *HEMIGRAMMUS CAUDOVITTATUS* E. Ahl.

*Tetragonopterus* sp. von BUENOS AIRES, Rachow, Wochenschrift für Aquarien- und Terrarienkunde, 1922, 19, No. 8, p. ?, fig.

*Hemigrammus caudovittatus* AHL, Wochenschrift für Aquarien- und Terrarienkunde, 1923, 20, No. ?, p. ?, fig.; Zool. Anz., 1924, 58, p. 360.

*Hyphessobrycon anisitsi* (non Eigenmann) MYERS, Fish culturist, 1923, 3, p. 250, fig.

HABITAT.—Buenos Aires.

One specimen	85	Coll. of G. S. Myers	63 mm.	Buenos Aires
One specimen	17667 I.		52 mm.	Buenos Aires

Head 4. Depth 3.25 (male) to 2.5 (female). Dorsal 11. Anal 26 to 27. Scales 34 + 3 lateral, transverse 12 or 13. Lateral line on 7 to 10 scales. Eye 2.66 to 2.8 in head. Snout .66 eye. Interorbital slightly greater than eye, 2.66 to 2.5 in head.

Compressed, depth of head at occipital process 1.6 in greatest depth in female, 1.4 in male. Preventral area but little rounded, nearly flat, with a series of rather sharply bent scales on each side, as in the genus *Tetragonopterus*. No regular median series of scales in the specimens examined. Predorsal area also somewhat flattened, less so than the predorsal area, with a median series of 10 scales, the series not reaching the occipital process, its place forward being taken by the scales of the two bordering rows. There is a slight ridge down the center of the median row.

Occipital process 4 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital slightly convex. Frontal fontanel triangular, not wider than the parietal fontanel, which is (without the occipital groove) .33 longer than the frontal. Great suborbital leaving a narrow naked margin behind, in contact with the lower limb of the preopercle below. Maxillary slightly less than eye, extending to under anterior part of orbit. Mandible greater than eye, 2.1 in head. Premaxillary with four 3- to 4-pointed teeth on each side in the first row, and five 5-pointed teeth in the inner row on each side. Maxillary with a single tricuspid tooth, far down behind the membrane at the upper part. Each side of the dentary with a graduated series of four 4- to 5-pointed teeth, followed by a series of minute, recurved, conical or notched teeth.

Gill-rakers 5 + 10 slender sharp points.



Anal sheath of 13 or 14 scales, the anterior mostly small and irregular, the posterior large and regular. Caudal with rather large scales over the basal third or fourth.

Dorsal origin midway between caudal base and snout tip, the penultimate ray .33 the longest, which is 4.2 in the body length. Anal inserted on vertical of the last dorsal ray in the female, slightly further forward in the male. Anal slightly emarginate, the longest ray a little more than two in the base. Caudal half an eye diameter longer than head. Pelvic fins inserted an orbit diameter before vertical of dorsal origin, reaching the anus in the female, and the first anal ray in the male. Pectorals slightly overlapping pelvies.

Humeral spot faint, practically absent in the specimens at hand, when present it is vertically elongate. A silvery lateral band, fading forward and ending posteriorly in a hastate caudal blotch, continued narrowly out to the tips of the central caudal rays. Dorsal shaded with dark. Anal and caudal edged with dark. Fins bright cherry red in life.

This fish was imported to Germany not long ago as an aquarium fish, and was later brought to the United States. From these aquarium specimens came Dr. Ahl's types, as well as the two examples here described. Dr. Ahl has described this fish in two different journals. The separates of the original description, in the "Wochenschrift" bear no page number. No copy of Rachow's paper in the same journal is at hand and the reference is taken from Ahl.

Dr. Ahl's second description is more complete than the original one, but in both he has overlooked the remarkable flattened preentral and predorsal areas, even stating, "Praeventralgegend abgerundet." The median preentral scale series, said to be complete by Ahl, is probably variable. Both of the published figures are inaccurate, but the one given by Rachow and Ahl very well illustrates the general appearance of the fish.

Page 161, to the synonymy of *Hemigrammus barrigonae*, add:

*Hemigrammus barrigonae* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 234.

Page 163, to the synonymy of *Hemigrammus schmardae*, add:

*Hemigrammus schmardae* FOWLER, Proc. acad. nat. sci. Phila., 1926, 78, p. 258 (Vic. Buenavista, Dept. Santa Cruz, Bolivia).

Page 164, before *Hemigrammus lunatus*, insert:

19a. HEMIGRAMMUS RHODOSTOMUS E. Ahl.

*Hemigrammus rhodostomus* AHL, Wochenschrift für Aquarien- und Terrarienkunde, 1924, 21, no. 18,<sup>1</sup> fig. (Pará); MEINKEN, idem, 1928, 25, p. 345, fig. (Aripiranga Is.).

<sup>1</sup> No page number is given on the author's separate.

HABITAT.—Pará.

“Am nächsten verwandt mit *Hemigrammus schmardae* (Stdr.). Der Körper ist seitlich zusammengedrückt; der Kopf ist 3.75–4 mal, die Körperhöhe 3–3.33 mal in der Körperlänge enthalten; Auge gross, 3 mal im Kopf; Praeventralgegend abgerundet, mit einer vollständigen mittleren Reihe von 11–12 Schuppen, Praedorsalgegend abgerundet mit einer vollständigen mittleren Reihe von 9 Schuppen. Schuppen 6–31 bis 33–5, die Seitenlinie durchbohrt 7–14 Schuppen; Interorbitalraum gleich dem Augendurchmesser; zweites Suborbitale nur einen äusserst schmalen nackten Rand lassend; Schnauze kurz, Maul klein; Praemaxillare mit 5, 5–7 spitzigen Zähnen in der inneren Reihe, and 3 fünfspitzigen Zähnen in der äusseren Reihe, Dentale mit einer Reihe von 5–6 fünfspitzigen Zähnen. Rückenflosse mit 10 Strahlen, ihr Anfang etwas näher der Schnauzenspitze als dem Schwanzflossenansatz; Afterflosse mit 14–15 Strahlen, hinter dem Ende der Rückenflosse; die Bauchflossen befinden sich hinter der ersten Schuppe hinter dem Anfang der Dorsalen.

“Die Färbung des zierlichen Fischchens ist in frischem Zustande hell leuchtend moosgrün auf dem Rücken; die Seiten sind gelblichweiss mit silbernem Schimmer; die ganze Schnauzenpartie vor den Augen, die Stirn und ein Teil des Oberkopfes ist leuchtend blutrot gefärbt, eine Färbung, wie ich sie an keinem anderen Fische dieser Gruppe kenne; eine ebensolche Färbung zeigt auch ein grosser Fleck hinter den Kiemendeckeln (Humeral-Fleck); in der Mitte der Körperseiten zieht sich ein schmaler Strich entlang, der sich allmählich, von unterhalb der Rückenflosse an, verbreitert und sich auf die mittelsten Strahlen der Schwanzflosse fortsetzt. Die Schwanzflosse ist ausserdem noch durch je eine den oberen und unteren Lappen ziehende schwarze Binde geziert. Rücken- und Afterflosse sind schwärzlich oder dunkelgrau mit weisslichen Spitzen, die Iris des Auges rötlich.”

Specimens have recently been received from Mr. Hermann Meinken of Bremen. The lateral black bar, continued strongly out to the tips of the central caudal rays, and the black blotch on the middle of each caudal lobe are characteristic of this species. In life it undoubtedly is a most gorgeous little fish. Meinken's figure gives a very good idea of the general appearance.

The specimens, from Aripiranga Island, average 28 mm. standard length, 35 mm. total.

Page 164, to the synonymy of *Hemigrammus lunatus*, add:

*Hemigrammus lunatus* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 39 (Rio Beni Basin: Beni Basin: L. Rogoagua, Ixiamas).

Page 171, before *Hemigrammus analis*, insert:

24a. HEMIGRAMMUS PAIPAYENSIS Pearson, sp. nov..

HABITAT.—Rio Pusoc and Rio Crisnejas, Andes of northern Peru.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
17643 I. Cotypes	Many	32-50	Paipay, Rio Crisnejas	Pearson
17644 I.	12	32-38	Rio Pusoc, above Balsas	Pearson

Caudal base scaled, the scales larger than usual in *Hemigrammus*. Lateral line variable, occasionally only a single scale lacking a pore. A few lack as many as 10, usually 2-5 scales without pores. Second suborbital in contact with the preopercle below. From the above characters it is seen that the species might be placed in *Knodus* if the lateral line should be considered complete, as it almost is in some specimens. In a few the caudal is indistinctly scaled and they could be placed with *Bryconamericus*. I have considered the lateral line incomplete and the caudal scaled; these characters place it in *Hemigrammus*.

Most closely related to *Bryconamericus grosvenori* from which it differs by having a scaled caudal and an incomplete lateral line, and to *Hemigrammus analis* from which it differs by having more anal rays and by having nearly all the teeth tricuspid.

Head 3.8 to 4; depth 3.2 to 3.4. D. 10; A. 14-15, usually 15. Scales 4.5-32 to 35-2.5. Eye 3 to 3.2 in the head. Interorbital 2.6 to 2.8. Fontanel enlarged at the ends, beginning above the posterior margin of the eye. Occipital process short, about one third of the diameter of the eye. Second suborbital in contact with the preopercle below, leaving a narrow naked area behind. Mouth moderate; the length of the maxillary 0.75 of the eye diameter, reaching to below the anterior quarter of the eye. All teeth usually tricuspid; when five cusps are present the lateral ones are indistinct. Maxillary with 4 teeth. Two teeth in the outer row of the premaxillary, 4 in the inner. Mandible with 4 teeth followed by 3 or 4 smaller ones. Gill rakers tubercle-like prominences, 7 on the lower limb of first gill-arch. Anal sheath consisting of 3 or 4 scales, covering the base of almost half of the anal. Lateral line lacking from 1 to 10 pores, usually 2 to 5. Origin of the dorsal slightly nearer to tip of snout than to base of caudal. Origin of anal slightly posterior to last dorsal ray, its margin truncate. Origin of ventrals below the third scale in front of the dorsal; ventrals not quite reaching anal. Pectorals not reaching ventrals. Caudal scaled near its base.

An indistinct vertical humeral spot above the lateral line; a silvery lateral band extending to the base of the caudal. Fins with many chromatophores but unmarked. *N. E. Pearson*.<sup>1</sup>

The larger females are gravid.

Page 172, line 26, for Dematocheir, read Dermatocheir.

Page 178, to the synonymy of *Hyphessobrycon callistus*, add:

*Hyphessobrycon callistus* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 39 (Lagoons, Lake Rogoagua and Reyes, Rio Beni Basin, Bolivia); FOWLER,<sup>2</sup> Proc. acad. nat. sci. Phila., 1926, 78, p. 258 (Vic. Buenavista, Dept. Santa Cruz, Bolivia).

Fowler, overlooking Pearson's record, believed his to be the first report of this fish outside the Paraguay Basin.

Page 186, to the synonymy of *Hyphessobrycon panamensis*, add:

*Hyphessobrycon panamensis* MEEK and HILDEBRAND, Field mus. publ. zool. ser., 1916, 10, p. 287 (Rio Chagres); EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 141.

Page 187, after last line, insert:

10a. *HYPHESSOBRYCON PANAMENSIS DAGUAE* Eigenmann.

*Hyphessobrycon panamensis daguae* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 141.

HABITAT.—Dagua and Patia Basins, Colombia.

This form was never formally defined by Dr. Eigenmann, having merely been mentioned, with a few distinguishing characters, in a letter from Mr. S. F. Hildebrand which was printed by Dr. Eigenmann in the above reference. The letter is here reproduced:

“Your specimens labeled as *H. panamensis* and *H. panamensis daguae*, can apparently be separated into two fairly distinct groups — those from the Rio Dagua and Rio San Juan having twelve scales in a vertical series between base of ventrals and base of dorsal — and those from the Atrato Basin having ten scales in this vertical series.

“The former, with respect to the scales, are like our Panama specimens, but they are larger, and the lateral line is often nearly complete, which is never the case in the Panama specimens; the fins also have fewer punctulations. In the Panama specimens, the anal fin usually has a dark tip.

“The Atrato Basin specimens differ from both the Panama, and the Dagua and San Juan specimens in the fewer scales in the vertical series. In size they agree with the Panama specimens, but in color with the Dagua and San Juan

<sup>1</sup> This species seems, without much doubt, to belong near some species of *Bryconamericus* or *Knodus*, but I leave it where Dr. Pearson has placed it. *G. S. Myers*.

<sup>2</sup> Specific name spelled *callistius* by Fowler.

specimens. The development of the lateral line in them is identical with the Panama specimens."

It would thus seem that the Patia-Dagua group have the vertical scales 12, the lateral line nearly complete, and the fins with fewer punctulations. It would also seem that the Atrato group is more distinct from the Panama specimens, in scale count at least, than are the Patia-Dagua ones. Whether Regan's *H. condotensis* is the same as *H. p. daguae* is not clear.

Page 199, to the synonymy of *Hyphessobrycon inconstans*, add:

*Hyphessobrycon inconstans* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 140.

Page 202, before *Hyphessobrycon santae*, insert:

21a. *HYPHESSOBRYCON COELESTINUS* Myers, sp. nov.

HABITAT.—Goyaz.

17665 I. Type. 29 mm. (23.5 mm. to caudal base). Lagoa Bonita, into São Bartholomeu, Goyaz, Brazil. Ternetz.

17666 I. 15. Paratypes. 26 to 29 mm. Same data.

Head 3.5. Depth 2.5 to 3. Dorsal 10 to 11. Anal 18 to 19. Scales transverse 11, lateral 31 or 32. Lateral line developed on 3 to 5 scales. Eye 2.5 in head, snout .5 eye, interorbital .75 eye, 3 in head.

Compressed, preventral area rounded with normal squamation. Predorsal region rather compressed, with a complete series of 11 scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital rather convex. Frontal fontanel triangular, .66 of the wider large parietal fontanel, without the occipital groove. Great suborbital leaving a narrow naked margin behind but scarcely below. Maxillary nearly equals eye, extending to almost below center of pupil. Mandible greater than eye. Pre-maxillary with 6 narrow tricuspid teeth (3 on a side) in the outer row and 5 heavier tricuspid teeth on each side in the inner row. Maxillary with 4 to 6 small, very evidently tricuspid teeth. Dentary with 5 tricuspid teeth on each side followed by a series of minute conical or notched teeth. Gill-rakers about 6+12.

Origin of dorsal very slightly nearer base of caudal than tip of snout, penultimate ray half longest, which equals the head length. Origin of anal on vertical of last dorsal ray. Anal border slightly emarginate, anterior tip not much pointed, third ray when depressed reaching to the base of the last ray, longest ray 1.33 in base of fin. Caudal slightly less than head. Pelvic fins inserted .25 to .33 eye diameter before vertical of dorsal origin, when depressed just reaching (male)

or not quite reaching (female) anal fin. Pectorals distinctly longer than pelvics, scarcely reaching pelvic base.

Bluish silvery, middorsal line and occiput smoky black. A dark, vertically elongate humeral blotch. Another sometimes present on opercle, appearing as if a second humeral spot. A dark blue lateral streak from upper end of gill cleft, ending in a horizontally expanded caudal blotch in the center of peduncle, this extending out to the tips of the central caudal rays. A colorless area on each side of this, and the outer caudal rays and the tips smoky. All the fins, including dorsal and pectorals, shaded and tipped with smoky. The dorsal is thus not plain, but it has no definite marking.

This beautiful little fish is closest to *H. santae*, with which it substantially agrees in most structural details. It differs in some minor characters, and in coloration. The specimens are all adult, showing it to be a smaller species than *H. santae*; the lateral line is shorter, and the teeth differ.

Page 203, to the synonymy of *Hyphessobrycon metae*, add:

*Hyphessobrycon metae* EIGENMANN, Mem. Carnegie Mus., 1922, 9, p. 234.

Page 211, to the synonymy of *Hyphessobrycon poecilioides*, add:

*Hyphessobrycon poecilioides* EIGENMANN, Mem. Carnegie Mus., 1922, 9, p. 140, pl. 24, fig. 1.

Page 215, before *Hyphessobrycon catableptus*, insert:

### 31a. HYPHESOBRYCON FLAMMEUS Myers.

*Hyphessobrycon flammeus* MYERS, Fish culturist, Philadelphia, 1924, 4, p. 330, fig. (Rio de Janeiro); MYERS, Blätt. Aquar. u. Terrarienk., 1925, 36, p. 98, pl. 1; SCHREITMÜLLER, t.c., p. 99; Rachow, Tropical Aquaria Fish Cat., 1927, p. 8, pl. 6.

HABITAT.—Environs of Rio de Janeiro.

Coll. of G. S. Meyers. Two, cotypes. 25 and 26.5 mm.<sup>1</sup> Rio de Janeiro.

Head 3.66 to 3.75 in body. Depth 2.66 in male, 2.50 in female. Eye 2.66 in head, equal to interorbital, twice as long as snout. Scales 33 longitudinally, 11 between dorsal and anal fins. D. 10; A. 25. Lateral line on but few scales.

Occipital process 3.5 in distance from its base to dorsal. Mandible equal to eye, maxillary a little less. Dorsal origin an orbit diameter nearer to snout than to caudal base, longest ray equal to head. Anal origin beneath last dorsal ray in female, beneath last third of dorsal in male. Pectorals a little more than reaching pelvics in male, not quite to them in female. Pelvics inserted .66 orbit length before vertical of dorsal origin, tips scarcely to third anal ray in male, barely reaching first ray in female.

<sup>1</sup> To caudal base.

Yellowish olive. Two vertical humeral spots and a median dark line down caudal peduncle. The area below this line and behind peritoneum, with the entire anal and pelvic fins, the basal part of the caudal, and all the dorsal save the tip, are flaming red, deepest along anal base. Dorsal tip colorless. Border of anal and pelvics edged with dark in life, this darker in male. A dark vertical bar through eye.

Distinguished from *H. bifasciatus* by the smaller size, more rounded snout and heavier head, the absence of dark pinnate markings along mid-line of sides, the more anterior dorsal, and the fewer anal rays. Common about Rio de Janeiro.

This species became well known as an aquarium fish before it was described by the writer, having been identified with *H. bifasciatus*, and under this name it was referred to repeatedly in both German and American aquarium journals. In 1926 the true *H. bifasciatus* was obtained by German aquarists. *H. flammeus* is now generally obtainable from dealers in aquarium fishes, being commonly known as "Roter Tetra von Rio" or "Red Tetra from Rio." It is not difficult to breed and rear in small aquaria.

Page 216, before *Hyphessobrycon stictus*, insert:

32a. HYPHESSOBRYCON SCHAUENSEEI Fowler.

*Hyphessobrycon schauenseei* FOWLER, Proc. acad. nat. sci. Phila., 1926, **78**, p. 254, fig. (Rio Inhangpy).

HABITAT.—Rio Inhangpy, Pará, Brazil.

"Depth 3; head  $3\frac{3}{4}$ , width  $2\frac{2}{3}$ . Snout 3 in head from snout tip; eye  $2\frac{1}{4}$ , greater than snout or interorbital; maxillary extends down obliquely opposite middle of eye, length 2 in head; jaws even; teeth moderate, mandibular little larger; interorbital 3, broadly convex; suborbitals broad, largely cover cheek. Gill-rakers 1+12, lanceolate, moderate.

"Scales 28 in median lateral series to caudal base and 3 more on latter, 9 transversely at anal origin, 11 predorsal. Fins all naked except scaly base of caudal. Scales with 2 or 3 radiating striae; circuli imperfect. Lateral line not evident. Dorsal II, 8, first branched ray long as head; adipose dorsal  $\frac{2}{3}$  of eye; anal III, 22, first branched ray  $1\frac{1}{3}$  in head; least depth of caudal peduncle 4; caudal forked, slender pointed lobes equal head; pectoral  $1\frac{1}{3}$ ; ventral  $1\frac{3}{5}$ .

"Pale grayish brown generally. Each scale on back and edge dusted with dusky, forming a reticulated appearance. Dark median streak down back and another following along side opposite vertebral axis, darker along tail and caudal peduncle. Diffuse humeral dusky blotch nearly as large as pupil. Costal region and cheeks sprinkled with dusky dots. Dark line along lower part of tail just

above anal base and another at and along front of anal base. Fins all uniform grayish.

"Type 31 mm. Rio Inhangpy, Pará, Brazil. Also three paratypes, 25 or 26 mm., same data. All obtained March 6.

"This species is greatly suggestive of *Hemigrammus orthus* Durbin from British Guiana, though with far deeper body and without a dark spot at the caudal base.

"Named for Mr. Rudolf M. deSchauensee, who collected the type." *Fowler*.

Mr. Fowler's description of the caudal scales and his allusion to *Hemigrammus orthus* suggests that this species may actually be nearer some forms of *Hemigrammus* than to any *Hyphessobrycon*. The character of the caudal scales can scarcely be said to indicate phylogenetic relationship in the Characins of this group.

Page 218, to the synonymy of *Hyphessobrycon ecuadoriensis* add:

*Hyphessobrycon ecuadoriensis* EIGENMANN, Mem. Carnegie mus., 1922, 9, p. 141.

Page 221, before *Hasemania*, insert:

36a. *HYPHESSOBRYCON BALBUS* MYERS.

*Hyphessobrycon balbus* MYERS, Bull. mus. comp. zool., 1927, 68, p. 115 (Lagoa Fervedeira).

HABITAT.—Goyaz.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1767Sa I. Type	1	47 <sup>1</sup>	Planaltina, Lagoa Fervedeira, Goyaz	Ternetz
31570 } 17678 I. }	Paratypes Many	23-60 <sup>1</sup>	Planaltina, Lagoa Fervedeira, Goyaz	Ternetz

Head  $3\frac{3}{5}$  in body length. Depth  $2\frac{1}{2}$  (young) to  $2\frac{1}{7}$  (adult). Dorsal 11. Anal 19 to 21. Scales 5-31 to 34-4 $\frac{1}{2}$ . Lateral line stuttering, complete on a few specimens, usually developed on 12 to 20 scales.

Dorsal origin in middle of body length, slightly behind vertical of origin of pelvies, which are reached by pectorals. Pelvies reaching not quite to anal fin. Adipose over end of anal. Body deep and much compressed.

Cheeks entirely covered by the great suborbital. Five 5-pointed teeth in the inner series of the premaxillary on each side. Four smaller teeth in the outer row. One wide tooth at upper limit of maxillary.

<sup>1</sup> Total.



Exposed surfaces of scales very deep and narrow, with few radial striae, little diverging. Scales over front of anal somewhat irregular and deflected towards the fin.

Dull, dark brownish, the scales prominently bordered with dark. A long vertical dark humeral bar with the suggestion of another a little way behind it. A faint dark lateral streak down posterior part of sides, ending in a slightly darker area at caudal base. A dark line to the tips of the central caudal rays. Dorsal and anal with dusky tips.

Differing markedly from the other species in the genus in the stuttering lateral line, the peculiar dusky color, the great depth and numerous other characters. It is not related to any species of *Astyanax*, in which genus the specimens with a complete lateral line might be placed.

Page 248, to the synonymy of *Astyanax abramis*, add:

*Astyanax abramis* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 40 (Rio Beni Basin: Lower Bopi, Rio Colorado, Popoi R., Ixiamas, Huachi, Rurrenabague, Rio Iniqui).

Page 250, to the synonymy of *Astyanax bimaculatus*, add:

*Astyanax bimaculatus* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 40 (Beni Basin, Bolivia: Lower Bopi, Rio Colorado, Popoi River, Ixiamas, Huachi, Rurrenabague, Rio Iniqui); FOWLER, Proc. acad. nat. sci. Phila., 1926, 78, p. 258 (Vic. Buenavista, Dept. Santa Cruz, Bolivia).

Pearson states that some of his specimens (locality not mentioned) agree with *A. b. paraguayensis*.

Page 277, to the synonymy of *Astyanax lineatus*, add:

*Astyanax lineatus* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 40 (Rio Beni Basin: Rio Colorado, Popoi R., Huachi, Rurrenabague Ixiamas, Tumupasa, Rio Iniqui).

Page 284, to the synonymy of *Astyanax ruberrimus*, add:

*Astyanax ruberrimus* MEEK and HILDEBRAND, Field mus. publ., zool. ser., 1916, 10, p. 281 (Atlantic and Pacific slopes of Panama and Colombia); BREDER, Bull. Amer. mus. nat. hist., 1927, 57, p. 120 (Rio Chucunaque, Darien).

Breder (p. 121) gives an interesting account of the habits of these small fishes. They appear to behave in the same manner as their more dangerous brethren, the notorious *pirayas* or *piranhas* (*Serrasalmo* and allies) of further south, swarming about any commotion in the water and even attacking bathers in the Darien streams, although their small teeth can do little harm to human victims.

" . . . They made bathing a rather exciting sport, closing in, often by the hundreds, and snapping at one with their sharp teeth. While, of course, unable to do any damage, indeed rarely drawing blood, their teeth were sufficient to give the sensation of a sharp pin prick. Their method was not to nibble, but to grasp a small amount of skin and hang on, 'bulldog fashion.' Only violent movements would keep them off and then on the slightest cessation they would close in again. . . . Their ferocity was such that even a slightly injured member of a school was at once torn apart to form food for the rest."

Page 292, before *Astyanax fasciatus*, insert:

47a. *ASTYANAX HASTATUS* Myers.

*Astyanax hastatus* MYERS, Ann. mag. nat. hist., 1928, ser. 10, 2, p. 87.

HABITAT.—Southeastern Brazil.

The specimens to which I apply this name are a variable and perplexing lot, closely related to *A. fasciatus*, but all of them appear to differ from that species in all its varieties in the hastate caudal spot, extending nearly or quite to the upper and lower borders of the caudal peduncle. In most other characters they seem to be near *A. fasciatus jequitinhonae* (Stdr.) but they surely are not that form. Neither do they exhibit the deflection of the scales of the anal region seen in *A. f. parahybae*. All are much smaller than the general adult size of *A. fasciatus*.

As holotype I have chosen an average-sized specimen, 48 mm. in total length. It does not show the extension of the spot on the central caudal rays as well as do most of the others, however. Its description follows.

Head 3.8. Depth 2.8. Dorsal 11. Anal 24. Eye 2.5 in head, a little greater than interorbital. Scales 6-35-4½. Ten rakers on lower limb of first gill-arch. Great suborbital covering nearly the entire cheek. Five wide 5-pointed teeth in the second series on each side of the premaxillary. Two teeth on each side in the first series. A single tooth at upper end of maxillary. Dorsal origin midway between caudal base and snout tip, a little posterior to pelvics. Pectorals just reach pelvics, which scarcely reach anal. Snout somewhat pointed; jaws equal. Scale rows regular, no interpolated series. A dark, rounded humeral spot, with a suggestion of a fine vertical elongation. A dark lateral streak ending in a hastate caudal spot. Scales not dark edged.

The twenty-five paratypes (30 to 52 mm.) show many variations. The caudal spot in all is very nearly the same, darker in some and in all but one or two showing clearly a fine black extension to the tips of the middle rays. Above and below this, basally, there are traces of a pale orange spot on the two or three alcohol specimens. The others were preserved in formaldehyde. The former specimens also show a silvery lateral band over the dark one. In a few the scales toward the back become very faintly dark edged.

The variation in depth is marked. In the largest specimen it is 2.33, and from this it varies down to that of the type. In the deepest specimen the transverse scale rows are 7-1-5½, the middle 1 signifying the lateral line scale. In another they are reduced to 6-1-4, while still others are 6-1-5. The lateral scales vary from 34 to 36, usually 35. The dorsal seems constantly 11. The anal varies from

23 to 26, usually 24 or 25. There are 10 predorsal scales in a complete regular series, apparently constant in all. The extent of the great suborbital varies somewhat, sometimes leaving a rather considerable naked border. The vertical fins are usually dusted with black chromatophores.

Three other specimens are distinguishable at once by their peculiar appearance, and they may belong to a different species. Their scales are very deep and heavily dark edged. The scale count is 5-36-4. The scales swing around so as to become very oblique over the pelvics and this continues to above the anal, although the rows hold their direction and there are no interpolated rows. The anal ray count is low, 20, 21, 22, in the three. The humeral spot in one is rounded, in another horizontally oval, and in the third it shows a tendency to vertical elongation. The caudal spot is darker than in most of the specimens of *hastatus*, but is somewhat more diffuse and less evidently hastate. The head is larger, 3.5. The suborbital leaves a wider margin below than behind. Length 45 to 54 mm.

Whether or not *A. hastatus* may eventually be considered a subspecies of *A. fasciatus*, it certainly seems to be a recognizable form. Aside from the caudal spot, it differs from *A. fasciatus* in the larger head (I believe the specimens are mature), the lower average scale count, the narrower interorbital, and the fewer predorsal scales.

All of the specimens were presented to me by Mr. Richard Dorn, who received them as living aquarium fishes directly from Mr. R. Brocea of Rio de Janeiro. The fishes were said to have been collected in the vicinity of the city, but there is a possibility of their having come from any of a number of places in southeastern Brazil.

Page 293, to the synonymy of *Astyanax fasciatus*, add:

*Astyanax fasciatus* FOWLER, Proc. acad. nat. sci. Phila., 1926, **78**, p. 251 (Pará); FOWLER, l.c., p. 263 (Rio de la Plata).

Page 306, to the synonymy of *Astyanax fasciatus aeneus*, add:

*Astyanax fasciatus* MEEK and HILDEBRAND, Field mus. publ., zool. ser., 1916, **10**, p. 280 (Pacific slope of Panama); BREDER, Bull. Amer. mus. nat. hist., 1927, **57**, p. 122 (Rio Chucunague, Darien).

*Astyanax fasciatus aeneus* HILDEBRAND, Bull. bur. fisher., 1925, **41**, p. 244 (Salvador: Rio Pampe at Chalchuapa, L. Guija, L. Metapan, L. Zapotitan, Rio Sueio at Sitio del Nino, Rio Lempa at Suchitoto and San Marcos, Rio San Miguel at San Miguel, L. Olomega).

*Astyanax aeneus* FOWLER, Proc. acad. nat. sci. Phila., 1916, **68**, p. 406 (Gatun); FOWLER, Proc. acad. nat. sci. Phila., 1923, **75**, p. 26 (Great Falls of the Pis-Pis R., and Marceligo R. at Miranda, Nicaragua).

*Astyanax aeneus costaricensis* MEEK, Field mus. publ., zool. ser., 1914, **10**, p. 105 (Atlantic slope of Costa Rica: La Junta, Guapilis, Parismina, Costa Rica R., Cub R., Zent, La Victoria, Chitana); FOWLER, Proc. acad. nat. sci. Phila., 1916, **68**, p. 389 (Guapilis).

The systematic status of the forms related to *A. fasciatus* north of Colombia is still far from satisfactorily defined. Dr. Eigenmann, doubtless by oversight,

neglected to carefully describe his Colombian material of *A. fasciatus* and all discussion of the Tetragonopterinae was editorially deleted from his "Fresh-water fishes of Northwestern South America," 1922. Hence we are unable to form an opinion regarding the relationship of the recorded Panama material. Meek and Hildebrand, 1916, who had access to Dr. Eigenmann's Colombian specimens, as well as to much material from further north, identify the species of west slope of Panama as *fasciatus*. They say nothing of relationship with *acneus*, however, and their description gives two maxillary teeth, which is the most tangible of the few characters defining the *acneus* group. Further, they do not mention the depth of the peduncle, also an important character. The writer has no material to clear up the difficulty and due to the confusion existing he refers all references from Panama and north to *acneus*.

Dr. Eigenmann entirely overlooked Meek's Costa Rica paper of 1914, containing the description of *A. a. costaricensis*. This is very possibly a recognizable race of *fasciatus* but at the present time the writer can do little else than refer to it as above.

Page 328, before *Astyanax guianensis*, insert:

72a. ASTYANAX SCINTILLANS Myers.

*Astyanax scintillans* MYERS, Ann. mag. nat. hist., 1928, ser. 10, 2, p. 88.

HABITAT.—Orinoco.

Two specimens, I. 36, 38 mm. Playa Matopalma Ternetz

A very distinct, small, highly iridescent species allied to *A. essequibensis*, from which it differs in the number of scales and anal rays, the position of the dorsal fin, and the lesser size.

Head 4.6 to 4.8. Depth 3.33; Anal 18 to 19. Dorsal 11. Scales 5-31-4. Predorsal 10. Eye 2.5. Interorbital nearly 3.

Predorsal and preventral areas rounded, each with a median regular series of scales. Scales all regularly set; no interpolated rows in anal region. Body well compressed but not greatly so, the greatest thickness 2.33 in depth.

Great suborbital covering entire cheek, except for a very small area at the upper posterior corner. Opercle excised above, similarly to *A. essequibensis*, but to a greater extent. This emargination or notch, seen to a greater or lesser extent throughout the genus, is better developed in *scintillans* than in any other. Pre-maxillary with two or three small teeth in the first series on each side; five 3- to 5-pointed teeth in the inner series on each side. One small tooth at upper limit of maxillary. In the mandible the second tooth from the middle on each side is set

down and a little forward, so that the front four teeth are nearly in a straight series across the front. The next (and last) two large teeth on each side are set higher and swing backward, followed abruptly by very fine teeth.

Dorsal origin midway between snout tip and caudal base or very slightly nearer the former. Pelvic fins under or a little anterior to dorsal origin. Pectorals not reaching pelvics by one scale. Anal emarginate.

Scales and head-plates gorgeously iridescent silvery, much more so than the ordinary *Astyanax*, and approaching the condition seen in *Creatochanes*. The silvering is so heavy that it obscures other body colors, the sides appearing leaden when not reflecting. It can be seen, however, that there is a darker, wide, plumbeous lateral band, from upper end of gill-slit to caudal base, but no humeral or caudal spots are discernible. Fins all clear.

This gloriously brilliant little fish is one of the most distinct in the genus. It has been directly compared with paratypes of *A. essequibensis*, the most closely related species, from which it differs widely in several characters.

Page 331, to the synonymy of *Ctenobrycon haurwellianus*, add:

*Ctenobrycon haurwellianus* PEARSON, Indiana univ. studies, (1924) 1925, No. 64, p. 41 (Rio Beni Basin).

Page 339, line 4, for HABITAT.— Headwaters of the Paraguay Basin, read:

HABITAT.— Headwaters of the Paraguay and Beni Basins.

Page 340, line 18, for HABITAT.— Upper Paraguay Basin to the Basin of the Rio Beni, Bolivia, read:

HABITAT.— Basin of the Rio Beni, Bolivia.

PAGE 350, lines 9 and 10, for Corynopominae, read Glandulocaudinae.

Page 362, before *Bryconamericus hemigrammus*, insert:

1a. BRYCONAMERICUS TERNETZI, Myers.

*Bryconamericus ternetzi* MYERS, Ann. mag. nat. hist., 1928, ser. 10, 2, p. 89.

HABITAT.— Upper Rio Negro, Brazil.

One specimen I.                      59 mm.<sup>1</sup>                      Camanáos Rapids                      Ternetz

Head 4.4. Depth 3.1. Dorsal 9½. Anal 18. Scales 4½–36–3½, Eye 2.4 in head. Interorbital 2.8.

Mediumly heavy set, well compressed, deepest at dorsal origin, greatest thickness 2.2 in depth. Orbit obliquely oval. Lower jaw slightly included. Pre-ventral area rounded, postventral rather sharp, squamation normal. Predorsal

<sup>1</sup> Total.

area rounded, with a medium series of 8 scales, a distance equal to two others naked.

Occipital process short. Skull smooth and but little convex in transverse section; frontal fontanel triangular, small; parietal fontanel much larger. Cheek not very deep, the great suborbital covering the entire cheek, touching the preopercular suture, angle, and lower limb, leaving a slight naked area only far up near the first postorbital.

Maxillary-premaxillary border forming a rather abrupt angle, as is common in the Tetragonopterinae. None of the maxillary curve is concave, all convex. Four 5-pointed teeth in the inner series of the premaxillary on each side. An outer series composed of five small teeth on each side, three set forward and the two alternate ones set back a little. Maxillary with three tricuspid teeth crowded to its upper end. Five graduated 5-pointed teeth on each side in the dentary, the third one somewhat raised, canine-like. Following these are four or five very small tricuspid teeth. Tips of all teeth brown.

Nine rakers on lower limb of first gill-arch.

Scales thin, the only two radii present delimiting the visible sector of the scale; regularly imbricate with no interpolated rows over the anal. An anal sheath of a single series of small scales over the base of the first two thirds of the fin.

Dorsal origin exactly midway between snout tip and caudal base, slightly posterior to vertical of pelvic fin origin. Pectorals do not reach pelvics by one or two scales. Pelvics reach anus, but not anal fin. Anal fin inserted just posterior to vertical of base of last dorsal ray.

Silvery, scales of back dark edged. A pale, diffuse, silvery lateral band, nearly lost in the silver of the sides. A faint vertical humeral blotch. No caudal spot. Fins shaded with dusky.

Very near *B. deuterodonoides* and its allies, differing, among other things, in depth and dentition.

The irregularity of the first series of premaxillary teeth, together with the included lower jaw and oval orbit, would easily lead one not well acquainted with these fishes to place the present species in *Creagrutus*, especially while working with the key (p. 50 *supra*). The dentition is, however, the typical one of Bryconamericus, as seen in the genotype, *B. exodon*, and differs widely from the massive teeth of *Creagrutus*.

Page 382, to the synonymy of *Bryconamericus emperador*, add:

*Bryconamericus emperador* BREDER, Bull. Amer. mus. nat. hist., 1927, 57, p. 123 (Rio Chucunaque, Darien).

Page 401, before *Hemibrycon*, insert:

23c. BRYCONACIDNUS Myers, gen. nov.

$\beta\rho\acute{\iota}\kappa\omega$ , hence Brycon, and  $\acute{\alpha}\kappa\acute{\iota}\delta\rho\omicron\varsigma$ , weak.

TYPE.—*Hyphessobrycon ellisi* Pearson.

This genus is Bryconamericus with an incomplete lateral line. The dwarf type species has no close relation with any of the forms of *Hyphessobrycon*, where it was first placed.

HABITAT.—Eastern Andes of Bolivia and Peru.

*Key to the Species.*

- a. Depth 3.8 to 4; a conspicuous vertical humeral bar; back and sides heavily sprinkled with large dark chromatophores, coloration dark.....1. *ellisi* Pearson.  
aa. Depth 4.2 to 4.7; an indistinct humeral spot; coloration light, normal....2. *hemigrammus* Pearson.

1. BRYCONACIDNUS ELLISI (Pearson).

*Hyphessobrycon ellisi* PEARSON, Indiana univ. stud., 1924, No. 64, p. 39 (Espia)

HABITAT.—Rio Beni Basin and the Rio Chanchomayo.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
17343 I. Cotypes	55	24-38	Espia	Pearson
17344 I.	34	27-36	Tumupasa	Pearson
17345 I.	34	22-30	Popoi River	Pearson
—— I.	2	25-26	Rio Chanchomayo, La Merced	Allen

Head 4; depth 3.8 to 4; D. 10; A. 15 to 17; eye 3 to  $3\frac{1}{3}$ ; lateral line 4-33 to 35-2, incomplete, in some specimens only lacking 5 or 6 scales of being complete, in others not more than half of the scales with pores; body compressed; inter-orbital equal to the eye; maxillary with 2 polycuspid teeth; 2 or 3 tricuspid teeth in the outer series of the premaxillary; 4 five-pointed teeth in the inner series; mandible with 4 or 5 large five-pointed teeth followed by 5 or 6 smaller usually tridentate teeth; gill-rakers 6 + 7; second suborbital in contact with the preopercle below but leaving a wide naked margin behind; many tactile papillae on the head appearing as tiny orange dots; frontal fontanel small triangular, its length about  $\frac{1}{6}$  that of the diameter of the eye; the parietal slightly less than  $1\frac{1}{2}$  times the diameter of the eye; snout rounded; predorsal area widely rounded back of the occipital process, with a narrow crest in front of the dorsal; origin of the dorsal equidistant from the tip of snout and the base of the caudal; pectorals not reaching ventrals; ventrals scarcely reaching the anal; origin of anal

under the eighth dorsal ray, very slightly emarginate, the longest ray 2 times in the head; anal sheath consisting of only 2 to 4 scales, covering the first 4 to 8 rays; caudal lobes equal to the head in length.

Humeral spot distinct, vertical, separated from the head by 1 or 2 scales; a dark silvery lateral band half the total length ending in a small black caudal spot that is not continued on the middle caudal rays; numerous chromatophores on the head and body, thickest on the back and above the anal, very few on the abdomen below the lateral line; fins unmarked.

Page 362, transfer *Bryconamericus hemigrammus* to the genus *Bryconacidnus*, as follows:

## 2. BRYCONACIDNUS HEMIGRAMMUS (Pearson).

This species may not be as closely related to *B. ellisi* as the descriptions would indicate and the genus is possibly polyphyletic. We do not yet have a key to the mensuration of phylogenetic differentiation in the tetragonopterid characins, and until we do it would seem the best course to follow the existing method.

Page 413, to synonymy of *Hemibrycon dariensis*, add:

*Hemibrycon dariensis* BREDER, Bull. Amer. mus. nat. hist., 1927, 57, p. 123 (Rio Chucunaque, Darien).

Page 417, before *Creagrutus*, insert:

## 24b. CREAGRUDITE Myers.

*κρεαγρευτος*, hence *Creagrutus*, and *δέρη*, with the force of "born of."

*Creagrudite* MYERS, Bull. mus. comp. zool., 1927, 68, p. 117.

TYPE.—*Creagrudite maxillaris* Myers.

Premaxillary teeth in a triple series in the young, formed of an inner series of large tricuspid teeth, four on each side, and a double outer series of three small teeth on each side, the first and third set out to form the first series and the second one set back to form the second series. There are thus but two teeth, one on a side, in the second series. With age, this second tooth migrates forward and takes its place between the first and third tooth, so that in the adult there are but two series of premaxillary teeth.

The body-form is elongate and very little compressed, the head and jaws being particularly lengthened, so that the fish has a very characteristic physiognomy, resembling, but very distinct from *Creagrutus*. The snout is as long as the very large eye, and the widened postorbitals nearly equal it. The gape is very great. There is a considerable resemblance of the mouth to that of *Bramocharax* or of *Scissor*. The relationship may be in this direction. In young specimens the snout is much less elongate.



The lengthened maxillary sweeps backward and downward in a great concave curve, its horizontal extent nearly twice the vertical. The maxillary is fully toothed to near its end, with twelve strong backward-pointing tricuspid teeth.

There are two large tricuspid teeth on each side of the mandible, these followed by a graded series of nine strong retrorse tricuspid teeth. The snout and jaws are pointed when seen from above or below, so that all the tooth-series are rather acutely angled in the middle.

The cheeks are fully armed with the exception of a narrow border along the vertical limb of the preopercle. The preventral and predorsal squamation is normal, the caudal is naked, and the lateral line complete.

This genus differs from *Creagrutus* in the dentition, in the long snout and peculiar maxillary, in the elongated uncompressed form, and in other characters. In the key (p. 50, *supra*) it falls in *Hemibrycon*, from which it differs in the whole habitus, the dentition, the maxillary, and the long snout.

HABITAT.—Northern and western slopes of the Guiana highland, probably in the whole surrounding region.

#### 1. CREAGRUDITE MAXILLARIS MYERS.

*Creagrudite maxillaris* MYERS, Bull. mus. comp. zool., 1927, **68**, p. 118 (Cucuihy and Cassiquiare).

HABITAT.—Upper Rio Negro and the Cassiquiare.

##### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
17682 I. Type	1	95 <sup>1</sup>	Cucuihy	Ternetz
31572 } Paratypes	2	92, 33 <sup>1</sup>	Cucuihy	Ternetz
17683 I. }				
17684 I. Paratypes	2	49, 58 <sup>1</sup>	Mouth of the Curamuni, Rio Cassiquiare	Ternetz

Head  $3\frac{5}{8}$  in body-length. Depth 5. Eye  $3\frac{1}{5}$  in head-length, somewhat greater than interorbital. Dorsal 10. Anal  $10\frac{1}{2}$  to  $12\frac{1}{2}$ . Scales 4–41 to 42–3.

Body long, spindle-shaped, little compressed, greatest thickness  $1\frac{1}{2}$  in depth. Eye large, equal to the long snout. Jaws about equal, the lower slightly included. Dorsal origin half an orbit-diameter nearer snout tip than caudal base, slightly anterior to pelvic insertion in adults, over or slightly posterior to pelvics in younger specimens. Anal inserted under tip of depressed last dorsal ray. Pectoral tips half length of fin from pelvics. Pelvics not reaching anal by three or four

<sup>1</sup> Total.

scales. Adipose inserted above last anal rays. Caudal well forked. Anal margin falcate, dorsal edge emarginate.

Yellowish, the scales of the back with a dark border inside a light one. A conspicuous vertical black humeral crescent. A diffuse silvery band, more sharply defined posteriorly, superimposed on a darkish band, ending abruptly at caudal base, discontinued for a short interval, and then continued as a dark line to tips of central caudal rays. A yellow spot at the base of the upper and lower caudal rays, continued faintly out to form a pale border to the caudal bar. Beyond the spots the caudal is shaded dusky. First pelvic and anal rays milky white; fins otherwise hyaline.

Page 418, remove *Creagrutus melanzonus* to the genus *Creagrudite*, as follows:

## 2. CREAGRUDITE MELANZONA (Eigenmann).

*Creagrudite melanzona* MYERS, Bull. mus. comp. zool., 1927, 68, p. 119.

This species seems to be based on young specimens of a species of *Creagrudite*. It appears to differ from the young of *C. maxillaris* in the scale count and in the presence of two teeth on each side in the second premaxillary series.

Page 420, before *Creagrutus mülleri*, insert:

## 2a. CREAGRUTUS PHASMA MYERS.

*Creagrutus phasma* MYERS, Bull. mus. comp. zool., 1927, 68, p. 117 (Cassiquiare).

HABITAT.—Rio Cassiquiare, Venezuela.

17681 I. Cotypes	2	61, 65 <sup>1</sup>	Mouth of the Curamuni, Rio Cassiquiare	Ternetz
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Head  $4\frac{1}{2}$  in body-length, equal to depth. Eye 3 in head, slightly greater than interorbital. Depth of caudal peduncle  $2\frac{3}{4}$  in head. Dorsal  $8\frac{1}{2}$ . Anal  $11\frac{1}{2}$ . Scales 37 to 38 lateral.

Dorsal originating somewhat more than an eye diameter nearer to snout tip than to caudal base, directly over insertion of pelvies. Pectorals not reaching pelvies by one or two scales. Pelvies not reaching anal by three scales. Anal inserted far behind dorsal, under tips of depressed last dorsal rays. Adipose inserted over base of last anal ray.

Great suborbital nearly as wide as eye, touching, but not ankylosed to, lower limb of preopercle, leaving a narrow naked border behind. Premaxillary dentition exactly as figured for *C. peruanus* (Pl. 35, fig. 4).

<sup>1</sup> Total.

Yellowish, the scales of the back with a dark border inside a lighter one. A large, conspicuous, vertical, dark humeral crescent (sometimes faint) over a deep black humeral spot that is entirely within the lateral band. A diffuse silvery band over a plumbeous one, wide anteriorly, narrow and more plainly defined posteriorly. The band ends at caudal base, then after a short indistinct break, it continues out to the tips of the central rays as a black line. A yellow spot at the base of the upper and lower caudal rays, continued out strongly, forming a border for the dark streak. Caudal slightly dusky above and below the yellow spots. First rays of pelvies and anal milky white. Fins otherwise hyaline.

Apparently a mimic of *Creagrutite maxillaris*, which was taken at the same locality. The resemblance is startling. Closely related to *Creagrutus peruanus*, but differing decidedly in the lesser depth, the armature of the cheeks, the very distinctive color, and other characters.

Page 423, before *Creagrutus anary*, insert:

4a. *CREAGRUTUS ATRISIGNUM* MYERS.

*Creagrutus atrisignum* MYERS, Bull. mus. comp. zool., 1927, 68, p. 116 (Rio Maranhão).

HABITAT.—Rio Maranhão, Upper Tocantins, Goyaz.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
17679 L. Type	1	60 <sup>1</sup>	Upper Rio Maranhão	Ternetz
31571 } Paratypes	many	59–67 <sup>1</sup>	Corrego do Monjolo, trib. of the Maranhão	Ternetz
17680 L. }				

Head 4 in body-length. Depth  $3\frac{1}{2}$ . Eye 3 in head, slightly less than inter-orbital. Depth of caudal peduncle 2 in head. Dorsal  $9\frac{1}{2}$ . Anal 12. Scales  $4\frac{1}{2}$ –35–3.

Dorsal origin an eye diameter nearer to snout tip than to caudal base, over insertion of pelvies. Pectorals not reaching pelvies by two scales. Pelvies almost reach anal fin. Anal origin far behind dorsal base, slightly anterior to vertical of tips of appressed last dorsal ray.

Great suborbital nearly or wholly as wide as eye diameter, touching lower limb of preopercle but not ankylosed with it, leaving a considerable naked area at the angle and behind. Premaxillary dentition resembling that of *C. beni*. Two maxillary teeth.

Yellowish, scales of back with dark bases. A narrow silvery lateral band, faint anteriorly, ending in a small caudal spot entirely within the band (sometimes very faint) and extending outward to the end of the middle caudal rays.

<sup>1</sup> Total.

A dark *horizontal* humeral bar entirely within the lateral band, and another small fainter brown spot (sometimes nearly absent) above and forward of it. Dorsal deeply flushed with black, darker toward margin, pale basally. Caudal and anal dusky.

Allied very closely to the *beni-affinis* group of the genus from all of which it differs in minor characters and widely in coloration.

Page **425**, to the synonymy of *Creagrutus affinis*, add:

*Creagrutus affinis* BREDER, Bull. Amer. mus. nat. hist., 1927, **57**, p. 124 (Rio Chucunaque, Darien).

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